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VOL. II

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Second Biennial Report of the State Forester of California, 1908.

3d Report See Vol. 9

Fourth Biennial Report of the State Forester of The State of California, 1912.

Annual Fire Report -- California State Board of Forestry, 1913.

The Forest Protection Problem in California, 1914

Fire Prevention Day. California State Board of Forestry.

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Forestry

REPORT

OF THE

STATE FORESTER

FOR THE PERIOD

JULY 12, 1905, TO NOVEMBER 30, 1906

Being the First Public Report of the Office, Established by the
Act of March 18, 1905 (Chapter 264, Statutes 1905),
for the Preservation of California Forests.

SACRAMENTO:
W. W. SHANNON, : : : : SUPERINTENDENT STATE PRINTING.
1906.

STATE BOARD OF FORESTRY.

GEORGE C. PARDEE	GOVERNOR.
C. F. CURRY	SECRETARY OF STATE.
U. S. WEBB	ATTORNEY-GENERAL.
G. B. LULL	STATE FORESTER.

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SACRAMENTO, CAL., November 27, 1906.

To His Excellency, GEORGE C. PARDEE, *Governor of California.*

SIR: I have the honor to transmit to you this first public report, reviewing the work of this office under the Act of March 18, 1905, and recommending legislative action along specified lines to broaden the scope and increase the efficiency of the forest laws. These recommendations are embodied in an amended forest bill which accompanies this report.

A detailed report of particular value for office use was submitted to you by Mr. E. T. Allen on his resignation, as State Forester, on July 1, 1906. For obvious reasons much of the information and many recommendations which appear here were taken from this earlier report.

Very respectfully,

G. B. LULL,
State Forester.

REPORT OF THE STATE FORESTER.

In this report it is proposed to treat in a practical way of the decline of the forests of California and their increasing importance to the industrial life of the State. The attitude of the State toward them will be defined and the experiences gained under the laws enacted to preserve them will be recorded. Particular emphasis will be placed on the limitations and defects of the laws, in the hope that those interested in the permanent welfare of the industries dependent on forest preservation will unite to secure more effective forestry legislation.

THE DECLINE OF THE FOREST.

To gain a clear idea of the change in the condition of the forest that has occurred in the course of settlement it will be helpful to compare its present state with the virgin forest. Picture a forest of unbroken continuity cloaking from summit to plain the mountains on both sides of the great interior valleys from the Oregon border southward to the Tehachapis where the two branches united to extend a long, hook-shaped arm over the uplifted areas surrounding San Bernardino Valley and the adjacent plain! The quality of the forest varied greatly in different localities, because numerous species were confined to certain regions by the natural factors, soil, climate, and elevation. The redwood forest occupied an area along the northwest coast over which ocean fogs drifted in summer; spruce and fir grew in the higher elevations; next below came the cedar with sugar and yellow pine, while nearer the valley, as a fringe to the heavy forest, was a belt of shrubs, or chaparral, intermixed with oak and drought-resisting pines. This magnificent resource, covering approximately 34,000,000 acres, or one third of the State, was unequaled by that of any other State in either the size and perfection of individual trees or its location on lands unfit for other uses.

The area of forest land in the State to-day is practically identical with the original area, very little having been turned to other uses. The changes, therefore, have resulted solely in a reduction of the area of merchantable timber. Two causes have operated to effect this change, lumbering and fire.

Lumbering.

The vast amount of material taken from the forest to supply the demands of settlement and development has been duplicated or exceeded by useful timber of lesser value, which has been sacrificed and rejected. The woods are full of moss-covered trunks from which only the butt log has been taken. When only the best material would bear the cost of milling and marketing the inferior had to be left, even if there had been a thought of taking it, which is improbable, for the supply seemed inexhaustible. As a result, lumbering has left the forest in an unsightly and deplorable condition. Lumbermen have been called "vandals" because of it, yet they have simply catered to the wants of a fastidious public. Their actions have been determined by economic conditions.

It is estimated that twenty per cent of the redwood area has been cut over. Fire has been used there as a necessary step in the operation, but as a coppice growth follows in spite of it, it is doubtful if the merchantable area of redwood timber would have been permanently reduced had succeeding fires been prevented. A relatively small portion of this area, when cleared, has been turned to other uses.

In the yellow and sugar pine belt two methods of cutting have been followed: a culling method, whereby only the larger trees are removed, and clean cutting, which results in complete removal. Practically all of the accessible portions of the Sierra forest have been worked over according to one or the other of these methods.

Fire.

The condition of the forest after lumbering is ripe for fire, the danger from which is multiplied by the protracted drought of California summers. Engines, campers, prospectors, lumbermen and, in fact, every possible source of fire, combine with these conditions to cause conflagrations. Following fire, chaparral species invade the burned area, and the composition of the forest changes from merchantable timber to brush. Thus the fringe of chaparral, which formerly bordered the forest, has invaded it to the permanent exclusion of other species, unless artificial replacement is resorted to. Chaparral now holds the land on whole townships which formerly produced merchantable timber, and the cause of its extension remains unchecked.

It must not be inferred that land encroached upon by chaparral is worthless and unworthy of care. In general, it is true that such areas will never bear merchantable timber again unless planting is resorted to, but as a protective cover to watersheds heavy chaparral is almost as good as a stand of forest species. Hence, for this reason alone the areas now occupied by chaparral should receive full protection, while unusual care should attend lumbering to prevent fires from causing the brush to enroach still further on areas producing merchantable timber.

THE DIRECT VALUE OF THE FOREST.

The value of the forest as a source of useful material is so evident that it will be sufficient to dwell briefly on this important province. It is impossible to imagine a civilization without wood. Even the commonest articles used habitually require wood for their manufacture, although usually only the channels of greatest consumption, such as railroads, buildings, mines, etc., are considered. Moreover, the uses of wood, multifarious now, are steadily increasing.

Some conception of the direct financial significance of the forest may be gained from the following incomplete figures collected by the Forest Service:

The total cut of lumber in California during 1905 approximated 1,219,000,000 board feet, or 4.4 per cent of the total cut in the United States.

In the production of shingles California stood second, being credited with 562 million.

Virginia was the only State to exceed the 48,144 cords of tanbark supplied by California.

California's standing timber to-day probably represents an intrinsic value of much more than $200,000,000. When manufactured it will be worth fifteen times as much, and this immense wealth will be distributed into the pockets of every citizen, because it will be created by labor and the wages will be paid into circulation. It is roughly estimated that even now the forest products of the State bring an annual revenue of $20,000,000. Considered thus alone, as a financial resource, the value of the forest to the State assumes tremendous importance.

THE INDIRECT VALUE OF THE FOREST.

It might be possible, although perhaps prohibitively expensive, to import forest products from other states; but water must be had at home, and it is unnecessary here to dwell upon either its paramount part in the life of California or its dependence on forest-covered sources.

Although there is great divergence of opinion among laymen regarding the importance of forests in regulating run-off, general opinion is unanimous in conceding that the removal of forests is followed by the disturbance of water levels. Whenever the demand for water makes this question acute, a lucid explanation showing the almost irrevocable damage done by denuding the watersheds is commonly followed by nervous haste to repair it. This, however, requires a long period of time and often vast expenditures.

Where other industries monopolize the attention of the greater part of a community, even temporarily, so that need for water for irrigation is not pressing, forest destruction is allowed to proceed, unmindful of the future, although present populations must concede that the ultimate employment of all tillable lands will be for agriculture, and that this will be impossible without water. The two conditions can be forcibly illustrated by comparing the sentiment for forest protection and forest planting in the intensively cultivated San Bernardino Valley with the apathy existing in certain undeveloped sections of Northern California.

The awakening in the south came when Mr. W. C. Mendenhall* of the Hydrographic Survey showed conclusively that the water level of San Bernardino artesian basin is being lowered rapidly as the result of over-use, explaining further that the denudation of the tributary watersheds caused the water to pass over the valley in floods without giving it time to filter through the porous soil into the underground reservoir. Concerted action for forest replacement has characterized the south ever since.

In forested areas the mechanical force of falling rain is dissipated when it strikes the foliage, consequently the soil is not compacted. The water then drips on to the litter-covered soil or runs down the trunks to the ground, where it is prevented from following the slope to the valley by obstructing vegetation. The absorbing humus underneath the trees keeps the upper layers of soil loose and friable, while the retreating roots afford channels along which the water seeks lower levels, percolating through the soil slowly, instead of passing over it rapidly, to points below, where it is forced to the surface by an impervious stratum and released. Thus streams from forested watersheds receive their supplies slowly and regularly, which accounts for their uniformity throughout the year.

On non-forested watersheds the mechanical force of the drops compacts the upper layers of soil, which are usually hardened at the outset by exposure to sun and wind. No obstructing vegetation prevents the rapid escape of the water to the stream below along small depressions, from which, owing to its velocity, it is enabled to carry heavy loads of material. Thus streams from denuded watersheds are subject to floods immediately following every rain, which during their short duration incumber the valley below with all manner of débris, succeeded by lapses into drought conditions until the next rains. The City of Hollywood expends several thousand dollars every year to clear away débris deposited from this cause. Facts bearing on the part played by forests in regulating stream flow were brought out by some measurements made for the Forest Service in the San Bernardino Mountains in 1899 and published in a paper by Prof. J. W. Toumey, Yale Forest School, entitled "The Relation of Forests to Stream Flow." The essence of the paper is contained in the following extract:

---

*The Hydrology of San Bernardino Valley. Water-Supply and Irrigation Paper No. 142.

> In a careful study of the behavior of the stream flow on several small catchment areas in the San Bernardino Mountains it has been found that the effect of the forest in decreasing surface flow on small catchment basins is enormous, as shown in the following tables, where three well-timbered areas are compared with a non-timbered one:
>
> **Precipitation and Run-off during December, 1899.**
>
> | Condition as to Cover. | Area of Catchment Basin. | Precipitation. | Run-off per Square Mile. | Run-off in Percentage of Precipitation. |
> |---|---|---|---|---|
> | | *Sq. Miles.* | *Inches.* | *Acre-feet.* | *Per Cent.* |
> | Forested | 0.70 | 19+ | 36— | 3 |
> | Forested | 1.05 | 19+ | 73+ | 6 |
> | Forested | 1.47 | 19+ | 70— | 6 |
> | Non-forested | .53 | 13— | 312+ | 40 |
>
> At the beginning of this rainy season, in early December, the soil on all four of these basins was very dry as a result of the long dry season. The accumulation of litter, duff, humus, and soil on the forest-covered catchment areas absorbed 95 per cent of the unusually large precipitation. On the non-forested area only 60 per cent of the precipitation was absorbed, although the rainfall was much less.
>
> **Rainfall and Run-off during January, February, and March, 1900.**
>
> | Condition as to Cover. | Area of Catchment Basin. | Precipitation. | Run-off per Square Mile. | Run-off in Percentage of Precipitation. |
> |---|---|---|---|---|
> | | *Sq. Miles.* | *Inches.* | *Acre-feet.* | *Per Cent.* |
> | Forested | 0.70 | 24 | 452+ | 35 |
> | Forested | 1.05 | 24 | 428+ | 33 |
> | Forested | 1.47 | 24 | 557+ | 43 |
> | Non-forested | .53 | 16 | 828+ | 95 |
>
> The most striking feature of this table, as compared with the previous one, is the uniformly large run-off as compared with the rainfall. This clearly shows the enormous amount of water taken up by a dry soil, either forested or non-forested, as compared with one already nearly filled to saturation. During the three months here noted on the forested basins about three eighths of the rainfall appeared in the run-off, while on the non-forested area nineteen twentieths appeared in the run-off.
>
> **Rapidity of Decrease in Run-off after the Close of the Rainy Season.**
>
> | Condition as to Cover. | Area of Catchment Basin. | Precipitation. | April Run-off per Square Mile. | May Run-off per Square Mile. | June Run-off per Square Mile. |
> |---|---|---|---|---|---|
> | | *Sq. Miles.* | *Inches.* | *Acre-feet.* | *Acre-feet.* | *Acre-feet.* |
> | Forested | 0.70 | 1.6 | 153— | 66— | 25— |
> | Forested | 1.05 | 1.6 | 146— | 70— | 30— |
> | Forested | 1.47 | 1.6 | 166+ | 74— | 30+ |
> | Non-forested | .53 | 1. | 56+ | 2— | 0 |
>
> The above table clearly shows the importance of forest in sustaining the flow of mountain streams. The three forested catchment areas, which during December experienced a run-off of but 5 per cent of the heavy precipitation for that month

and which during January, February, and March of the following year had a run-off of approximately 37 per cent of the total precipitation, experienced a well-sustained stream flow three months after the close of the rainy season. The non-forested catchment areas, which during December experienced a run-off of 40 per cent of the rainfall and which during the three following months had a run-off of 95 per cent of the precipitation, experienced a run-off in April (per square mile) of less than one third of that from the forested catchment areas, and in June the flow from the non-forested area had ceased altogether.

A less tangible effect of denuding catchment areas and one that escapes general observation is based on the physical law of capillary attraction. The compacting effect of falling rain, together with that of wind and sun, causes the upper layers of soil to harden and effects the formation of numerous capillary tubes, along which whatever water reaches underground retreats is carried to the surface by capillarity, where it is evaporated. The ground cover of forested land prevents these tubes from reaching the surface by keeping the upper layers of soil loose, as previously explained. Agriculturists recognize the losses from this cause and cultivate frequently to break up the tubes, exactly as a leaf mulch prevents their formation.

With these facts in mind the reason why reclamation engineers insist upon forested watersheds as a primal condition of dam construction is readily understandable. Just now California is looking to the Reclamation Service to install systems of irrigation, and upon the results of the work done within the next few years the growth of the State will depend in great measure. And in this connection it should not be overlooked that neither the Reclamation Service nor the State of California can maintain successful irrigation if fires are allowed to effect the frequent denudation of important watersheds. The willingness of both parties to spend money for this purpose is not sufficient; certain favoring conditions must be maintained or no permanent achievement will be possible.

THE FUNCTION OF THE STATE.

These facts form the basis for State concern, for, unlike the individual, who is interested in the welfare of his industry during his own lifetime only, the State must insure the perpetuity of all industries for succeeding generations. The pioneer epoch has always been marked by the squandering of resources with a wanton disregard for future needs. But as settlement progresses, attended by the establishment of industries requiring permanent sources of material, the period of exploitation is succeeded by that of utilization, gradually becoming more intensive, and in this tendency toward conservatism organized society precedes the individual. How often do we see the inclinations of the individual curbed when the common good is endangered!

Likewise, when the followers of any industry pursue their occupation to the point which endangers dependent industries it becomes the duty of the State to determine which industry shall survive or take restrictive action favoring the weaker which will permit both to continue. By extending this conception of governmental function somewhat it may be quite as firmly stated that the State's duty does not end when it becomes the arbiter of present generations; it is likewise the guardian of the rights of future generations. Its policy must be planned along broad lines to secure the welfare of all generations and the perpetuity of all industries by conserving the natural resources upon which these industries depend.

According to this postulate what attitude should California assume toward her forest resources? Manifestly it would not be just to legislate against the followers of the lumbering industry unless it could be positively foreseen that their methods, if unchanged, would wreck other industries equally dependent on the forest. Moreover, such action would arouse protest on the ground of restricting personal liberty, besides having a baneful effect on individual initiative. The extent of forest removal, for the present at least, must be determined by the economic law of supply and demand.

Without imposing any restrictions on the amount or methods of cutting, however, the State may prolong the life of her forest resources by effective legislation against the careless use of fire, assuming, in behalf of her continuing interest, some responsibility in the protection of forest property.

ACTION BY THE STATE.

Realizing something of the disaster invited by allowing wholesale forest destruction without replacement, and particularly the ravages of fire to go unchecked, as early as 1885 the State, preceding any other in this particular, passed an Act entitled "An Act to create a State Board of Forestry, and to provide for the expenses thereof." This State board, which was functionally a bureau of education, was endowed with police powers in 1887 and given an appropriation of $29,500 for salaries and expenses. Three botanical reports were issued by the Board, which at first did faithful work. Later, however, it succumbed to political influence and was abolished in 1893. Under this Act the first and only forest experiment stations in the United States were established at Chico and Santa Monica. When the Act was repealed these were transferred to the Agricultural Department of the University of California.

From 1893 to 1903 forestry in California was at a standstill, yet this period was one of marked need and of rapid development along other lines. It was the decade during which the lumbermen from the Lake states and Southern pineries flocked to California to invest in timber lands, and during which time California disposed of the bulk of her sole forest possessions by the sale of school lands at the ridiculously low price of $1.25 per acre. Similarly it was the period during which land fraud flourished, whereby much of the public timber land in California was lost to the National Government and the State.

In 1903 sentiment in favor of forest preservation was expressed in a different and more practical form when the Legislature provided for a thorough investigation of the forest resources of the State by the Forest Service, the expenses of which were to be borne equally by the State and Federal governments. A detailed account of the work done under this contract forms a separate chapter in this report.

Based on the studies of the fire problem and the recurring expressions of sentiment for forest preservation as shown by earlier legislation, an Act was passed by the Legislature in 1905 "to provide for the regulation of fires on, and the protection and management of public and private forest lands within the State of California, creating a State Board of Forestry and certain officers subordinate to said board," etc. An appropriation of $17,600 was made to defray all expenses incurred under this Act for two years.

THE FEDERAL FOREST RESERVES.

During the decade of State inactivity in forestry the Federal Government instituted its policy of reserving for the purposes of forest production such portions of the public domain as proved, on expert examination, to be of greatest use for that purpose. The needs of California were considered among the earliest states, as practically shown by the creation of San Gabriel forest reserve on December 29, 1892. During the succeeding interim the number of reserves in California has been increased to twenty, aggregating 18,877,110 acres. In the examination and location of reserves the utmost care has been exercised, so far as possible, to include only actual forest land which, by its location, is of particular importance in protecting streams of present or future value for irrigation. As a consequence, the reserves cover the high Sierras and their continuations where the streams of the San Fernando and San Bernardino valleys have their sources.

Each reserve is patroled by mounted men to prevent fires and administered by a local officer to maintain its greatest usefulness to the industries affected. California need feel no anxiety lest its interests there are not subserved. On the other hand, all energies should be directed toward aiding the Forest Service in its task of protection, for it is a well-known fact that more than half the damage to reserve resources is caused by fires entering from adjacent. unprotected areas.

A desire to coöperate with the State in preventing fires has led the Forester to direct that supervisors and rangers on the several reserves accept appointments as fire wardens. On numerous occasions rangers have left their districts to extinguish fire burning on private land, even when the reserve was not in particular danger. Moreover, their independence of local factions has enabled forest reserve officers to be of especial aid in apprehending violators of the laws and securing their conviction. Nearly half the convictions secured are due to their efforts.

COOPERATIVE WORK BETWEEN THE FOREST SERVICE AND THE STATE.*

By an Act of the Legislature, passed in 1903, the State Board of Examiners was empowered to enter into a contract with the Forest Service of the U. S. Department of Agriculture, for the purpose of investigating the forest resources of the State, determining the best means of conserving them, and formulating a State forest policy. By the same Act, $15,000 was appropriated for carrying on the work the first two years, with the provision that the Forest Service should contribute a like amount. This contract has been twice renewed since the conclusion of the first two years, with an additional appropriation of $5,000 by both the State and the Forest Service for each succeeding year.

Actual work in the State was begun by the Forest Service July 1, 1903. The coöperative work is, therefore, now in its fourth year and sufficient time has elapsed to make it possible to point to results, although certain lines of work are as yet incomplete.

General Lines of Work.

The contract outlines in a general way the lines which the work has followed, namely: A determination of the character and extent of the State's forest resources; the best methods of conserving them, and the formulation of a State forest policy.

For all of the above-mentioned purposes the first step necessary was the acquiring of a knowledge of the general condition and extent of the forests of the State. Accordingly, an examination of 21,000,000 acres of forest and brush land was made. This included the North Sierras, the Sierra Nevadas, Southern California mountains, and the greater part of the redwood belt. The work included also a general classification and description of the forest by types and a description of the timber resources by counties. As a result of the work a forest map of the State was prepared, showing the extent and location of the commercial forest, woodlands, and brush lands.

---

*By A. W. Cooper, Forest Service.

One of the most interesting questions in the preservation of the forest, both to the State and to private lumbermen, has been the protection of the forest lands from fire. This has been the subject of an extended investigation into the character, causes, and extent of forest fires, the purpose being to devise both general and special measures for checking them and preventing their occurrence. This investigation revealed the fact that the prevalence of fires might, to a great extent, be attributed to the non-enforcement of the State fire laws. The methods best adapted to fire prevention on individual tracts were found to be by patrol, fire lines, and the disposal of slash on logged lands.

In Southern California the question of water supply is all important and bears a close relation to the forest cover. On this account two more or less related lines of work were undertaken in the southern mountains. The first was a study of the chaparral or brush areas for the purpose of determining the possibility of their natural reforestation and their relation to the water supply. This study was later extended to similar areas in the northern part of the State. It revealed the fact that a brush cover is a very good conserver of moisture in the absence of a tree cover, that natural reforestation of such areas is a very slow and at best uncertain process, only taking place at all where fire is kept out for a long period, and that fire is the chief factor in the formation and spread of such areas.

The second study in this connection dealt with the reforestation of important watersheds by planting. Here the conclusion was reached that planting on the Southern California mountains, except in favored localities, will be a very expensive undertaking and of doubtful success, but that a careful choice of species for planting may make gradual reforestation possible in portions of the mountains.

State Forest Policy.

As a result of these general lines of investigation, which occupied largely the first two years of coöperative work, measures were formulated which, it was believed, the State should embody in its forest policy. These measures were submitted to the Legislature in the form of a bill, in the winter of 1905, and led to the Act of March 18, 1905, which revised the fire laws and created a State Board of Forestry and the office of State Forester.

Commercial Tree Studies.

While the general work already outlined was in progress a number of special lines of work were started. Among these were a number of commercial tree studies, the purpose of which was to provide accurate data regarding the habits and growth of the more important commercial trees, with the object of securing their continued presence in the forest by interesting timber owners in adopting methods of lumbering favorable to their reproduction. Studies of this sort were made of sugar pine, yellow pine, and white fir. A similar study had been made of redwood previous to the commencement of the coöperative work.

These studies showed that the rate of growth and character of the various species made them well adapted to conservative lumbering and the securing of successive crops of timber.

Studies somewhat similar to the above were made of eucalyptus and of tanbark oak. The eucalyptus study included the collection of growth figures from the principal eucalyptus groves, as well as estimates of the yield and the financial returns from planted eucalyptus in various localities. As eucalyptus is an introduced tree, the question of its propagation and extension was also important, and the study has dealt thoroughly with these points and with the uses and commercial value of the different species. It became apparent early in the study that the genus was one of increasing importance and great future value in sections of the State climatically adapted to its production. This led to the establishment by the Forest Service of an experiment station at the University of California for the purpose of testing the mechanical and physical properties of the different species of eucalypts, particularly in relation to their use for special purposes. These tests are still in progress, but have already revealed the fact that eucalyptus closely approaches Eastern hickory in its strength, toughness, and general durability.

Tests to determine the practicability of applying preservative treatment to eucalyptus were also made on fence posts. Creosote was the preservative used, and the tests demonstrated that eucalyptus could be successfully and cheaply treated. Sufficient time, of course, has not elapsed to determine the effect of treatment on the life of the timber.

The study of tanbark oak was botanical and dendrological in its character, but included a thorough study of the tanning industry and the present and future supply of tanbark oak. It showed that the supply now available would last thirty-five years at the present rate of consumption, and that the excellent productive capacity of the tree made the outlook for a continued supply excellent, provided a few simple measures were adopted in cutting the present crop.

Other Special Studies.

As a knowledge of the methods and cost of lumbering and of the lumber market in general is essential to perpetuate the forests, a study of lumbering and the timber market was made for all of the important commercial species of the Sierras. The study dealt with the relation of supply and output in different lumber centers and the extent and effect of outside competition, as well as with the different steps in and the cost of manufacture. The whole study has been an additional argument in favor of conservative lumbering.

Next to fire the most important question in the protection of California's forests is grazing. Therefore, this has been the subject of a separate investigation for the purpose of determining the effects of grazing on the forests and on watersheds and what regulations were necessary to prevent damage to both. The results of this investigation have been largely embodied in the present grazing regulations in force on the Federal reserves within the State.

At the request of the State two other special pieces of work have been undertaken. The first of these was the estimate and appraisal of the Calaveras grove of big trees, which was made pending the event of its purchase either as a State or National Park.

The other piece of work was the investigation of the amount and character of the State's delinquent tax lands. This investigation revealed the fact that nearly 500,000 acres of land in the forest regions of the State are delinquent and that the operation of the present tax laws are often defective, in that they virtually place a premium on delinquency and delay the acquisition by the State of a clear title.

The lands involved were found to be scattered in small lots, and a large part of them were within the boundaries of the Federal forest reserves. A system of exchange between the National and State government was, therefore, suggested, by which the State might consolidate its holdings, and, if desirable, establish State reserves.

Assistance to Private Owners.

The fate of the lumber supply in California depends in no small degree upon the lumbermen, who own a large portion of the State's forested area. It was recognized early in the work that practical examples of protection, conservative lumbering, and planting were the best means of arousing the general interest of lumbermen and private owners in these questions.

Plans for fire protection were accordingly prepared for a tract of 80,000 acres in the Sierras belonging to one of the large lumber companies of the State. A system of patrol, telephone lines, trails, and burning the slash on logged areas formed the basis of this particular plan, which was later extended to include marking trees for cutting.

Another plan for a still larger tract in the North Sierras had as its basis a system of fire lines for protecting the young growth; it also included a patrol, telephone lines, tool stations, and slash burning, and was later extended to cutting timber to a diameter limit. Both of these plans are in successful operation. A number of planting plans, for both large and small tracts and in one or two instances for city watersheds, have also been prepared from time to time.

Work in Progress.

As has been stated, certain lines of work have not been completed. The chief object of the coöperative work has been accomplished in the establishment of a State forest policy; but in order that the State work may be on a firm basis, with room for growth, it is necessary that the State Forester be amply provided with data and information on the character and resources of the State's forests. Such data are in large part received already, and all that remains is to round this out as much as possible. For this purpose one or two lines of work begun in former years are being extended. The study of eucalyptus and the tests on the timber are still in progress. The study of planting has been extended to the whole State, so as to include both agricultural and forest lands. This work is now nearing completion and it is hoped that the results can be embodied in a planting manual for the State.

An investigation of cut-over forest lands was begun this year, the purpose of which was to determine the extent of such lands, their present condition and use, and the attitude of the owners of such lands toward them. On this information it will be possible to base suggestions for their future improvement and disposal. The study of lumbering and market conditions has been extended to include the redwood belt.

The results of the past coöperative work between the State and the Forest Service have been embodied in some seventeen comprehensive reports and maps and in about forty-five special papers, most of which are now in the hands of the State Forester. A few of the results have been published by the Forest Service and others will be published from time to time.

REVIEW OF STATE FORESTRY WORK.

On July 12, 1905, a State Forester was appointed and actual forestry work begun by the State. Recognizing that relative security against fires is of paramount importance in determining the feasibility of forestry, all energies were directed to this end. And in this connection education and publicity were emphasized rather than rigid enforcement of the penal sections, both because no machinery for the latter could be secured without approval of the public, expressed by coöperation, and because it was deemed unwise to imperil the popularity of the movement, particularly in the beginning. Accordingly correspondence, calling attention to the State's forestry work, in the form of personal and circular letters, pamphlets, newspaper articles, etc., was commenced with all manner of organizations from San Diego to Siskiyou. The results quickly showed that the public was ready to assist.

The efforts of the State Forester to awaken interest in the sections providing for county coöperation were ably seconded by powerful organizations in all quarters. The Water and Forest Association continued the yeoman service it had performed in urging legislation to induce county boards to coöperate. The California Promotion Committee displayed its interest by making the State Forester a member of its advisory committee. Boards of trade and chambers of commerce throughout the State expressed a willingness to aid, while associations of lumbermen, stockmen, miners, and water-users were quick to volunteer. Independent lumbermen, ranchers, stockmen, and others throughout the State sought appointment as fire wardens, ignoring the fact that no compensation accompanied it, simply to protect their own and their neighbors' interests. Favorable action by county supervisors, however, did not follow without an appeal from the State Forester in person, and often not then.

As a result, largely on account of the lateness of beginning forestry work under the new law and the imperative demands made on the time of the State Forester by preliminary work, the season of 1905 closed with Santa Cruz County the only one pledged to coöperation. During the winter agitation was continued untiringly, with such encouraging results that on the opening of the fire season of 1906 immediate attention was given to several counties that were practically prepared to fall in line. As a consequence, the support of four more counties had been secured by June 30, 1906, when the resignation of the first State Forester occurred.

Since that time the established policy of the office has been consistently pursued. No work, however important, has been allowed to prevent attendance at the meetings of county supervisors, where every possible argument has been used to secure support. Twenty-three boards have been interviewed, some two or three times when hopes of ultimate success seemed to warrant it, and five counties have been added to the list, making a total of ten. In personal justification it must be added that this number is in no proportion to the effective work done and doubtless considerably smaller than it would have been had the season been less disturbed politically. In more than one case a single opposing member has effectively prevented favorable action by boards when the other four were willing to ordain in favor of the ordinance presented. In other cases failure has resulted when a petition signed by a majority of prominent taxpayers has been submitted to prove the favor of the people. As an instance of the apathy of county officers may be cited the case of one board in the San Joaquin Valley which has failed to recommend a single citizen for appointment as fire warden, in spite of several insistent requests from this office since the passage of an ordinance in August appropriating $500 for this purpose. From a neighboring county, where an identical condition obtains, names have been received from but one supervisor.

Coöperative work with landowners for forest replacement has been commenced, but little can be done at present, owing to lack of technically trained assistants. If the State were equipped for the work much good could be done, for the Forest Service has recently changed its coöperative offer and now requires that landowners pay both the salary and expenses of its agents. Formerly only the expenses were asked, and often not even them.

During the summer a patrol force of six men has been maintained by the State Forester on the proposed Stony Creek reserve. This force was supported by a joint appropriation made by Glenn and Colusa counties and the Stockmen's Defense Association for the purpose of protecting the area from fire pending its re-examination by the Forest Service. The results showed plainly the efficacy of patrol, despite the fact that the patrolmen were collected hastily and without much choice.

Through circular letters to lumber companies valuable data have been gathered on the annual cut of various species and the attention given to fire prevention. These reports show that but very few of even the best equipped companies take any steps to protect their standing timber.

ATTITUDE OF THE PUBLIC.

As was expected, recognition came first from the element which was responsible for the passage of the laws: organized forest and water interests, outdoor clubs, students of political economy, and forestry enthusiasts; these needed no convincing and gave their aid immediately in more or less practical ways. The test, however, is the response from other classes, particularly those whose support was needed to give the movement practical results. While the test is still in progress, it has been quite satisfactory so far. Indifference still prevails in some quarters; passive approval with small results in others; but indorsement is the rule. In no case has there been an unfavorable demonstration.

Attitude of Lumbermen.

The more practical lumbermen regarded the step critically at first. Believing in the object sought, they waited to see the methods employed. They knew the need for checking fires, but feared State forestry meant something less practical, if, indeed, not a direct attack on their own freedom. Some enthusiastic nature-lovers, who call their tenets forestry, are not charitable to lumbermen, so the latter waited to see the State's interpretation.

A few months showed a visible change, and a year a most decided one. The California Sugar and White Pine Agency, the most powerful lumber association in the State, offered its facilities and has been of much assistance. Independent lumbermen throughout the State, through constant correspondence with the State Forester, are of mutual assistance. Judging from the progress already made it can be safely predicted that close coöperation, instead of random effort, between the State Forester and members of the lumbering industry to reduce the damage from fires is an attainment soon to be realized. In this connection it can not be emphasized too strongly that *organized* effort on the part of all industries concerned is the only practical way to cope with forest fires.

Attitude of Kindred Organizations.

Not only the Water and Forest Association, but numerous power and irrigation companies have given indorsement and substantial help in many ways. The California Promotion Committee, representing all commercial organizations, recognized the business importance of the office and passed strong resolutions indorsing the work and urging counties to coöperate. Boards of trade, chambers of commerce, and women's clubs have taken similar action. Stockmen, miners, landowners, and water-users have all come to see that for the first time means exist by which they can get protection for their property, and are availing themselves of it.

Attitude of County Supervisors.

It can be stated at the outset that the personal attitude of county supervisors has been favorable without a single exception. Unfortunately, however, a favorable personal attitude does not always predicate official approval. Some boards are prevented from acting by the poverty of the counties they govern; others object to the provision that the State shall receive the fines collected, saying the State is imposing a burden on the counties to increase her own revenues. These arguments are doubtless well grounded.

Frequently those who are unused to organizations contend that volunteers appointed to act individually without pay or direction are quite as effective as a system supported by county appropriation. Some hesitate to approve such an innovation, fearing lest it react to unsettle their political security, while others plead for a month in which to consider it. It is safe to say that no argument will prevail in such cases, for the vision of such men is so circumscribed politically that their best attempts at evasion amount to begging the question.

Throughout the southern part of the State and the more enlightened counties of the San Joaquin Valley, however, the desire for protection and the prosperity of the counties has overridden the arguments of the first class, while those of the second have been deemed unworthy. Even here the attitude of the State has been deprecated, however, in spite of the fact that coöperation has been secured.

It can not be gainsaid that the conditions under which the State offers "coöperation" (which is a misnomer, for there is actually no coöperation, since the State retains all authority but accepts no responsibility) leave abundant room for objection, if personal or political reasons prompt the supervisors to make them.

Attitude of Magistrates.

According to Section 12 of the forest law, magistrates with proper authority must prosecute all cases brought to their attention with diligence and energy, under penalty of fine. In the actions of these officers the attitude of the supervisors is reflected very clearly. If the supervisors favor coöperation by appropriating the county's funds, the district attorney needs no urging to prosecute violators of the laws. If, on the other hand, supervisors evade coöperation the district attorney seeks legal subterfuges why prosecution should not be attempted. Of course, the position of the magistrate is so untenable usually that prosecutions might be secured by pressure, although it must be admitted that the probabilities of securing convictions through the agency of an unwilling officer are rather poor, while the chances would be that the county would be antagonized by being forced to accept an unsought burden to the extent that ultimate coöperation would be impossible. While no flagrant violation has been allowed to go unpunished, considerations of expediency have somewhat modified the State Forester's actions, for it has been fully realized that the present law is not perfect enough to stake the popularity of the forestry movement on. For this reason and because the ethical position of local officers has often been sound, forbearance has been the watchword.

Attitude of the Press.

The hearty coöperation of the press of the State is especially gratifying. Without a known exception favorable comment has followed every hampered attempt to enforce the laws. Many editors have voluntarily urged county supervisors to coöperate with the State for protection, both by commenting favorably on the action of other counties and by editorials. Many more have cheerfully given space for the publication of information of very general nature. It is safe to say that the activities of no other single department of the State receive more extended comment.

TECHNICAL FORESTRY.

Despite the fact that the Act contemplates the development of technical forestry in California by advice to landowners, and provides specifically for the preparation of plans for replacement and management of forests, the work of the first year included no aid of this kind.

This was largely due to the fact that the time of the State Forester was occupied in other ways and to the lack of assistants. Henceforth outside the fire season the policy will be to extend all possible assistance to applicants for expert advice.

In accordance with this policy a planting plan for the Union Lumber Company, Fort Bragg, California, is now in preparation. Although the basic data have not all been gathered, the object of the plan is to furnish complete directions for the formation of an eucalyptus plantation on unused portions of a cut-over redwood tract. The company has virgin supplies sufficient for several decades' cutting, and aims, on the exhaustion of these supplies, to have material grown for further operations.

Two other applications have been received recently. One for the establishment of a protective forest on an important watershed in Fresno County; the other for scenic planting on a large tract in Santa Cruz County. These applications will be attended to as time permits.

Beyond distributing copies of the forest laws, absolutely no publicity has been given the State's coöperative offer, for two main reasons: First, the low statutory salary allowed assistants does not permit the securing of technically trained men, hence all technical work devolves on the State Forester; and second, it is certain that the issuance of this offer would immediately invite so many applications that but few could receive attention.

The warm, equable climate prevalent throughout the greater part of California presents conditions, possessed by no other State, for the rapid production of many species of eucalypts. In the past the blue gum (*E. globulus*) has been planted more extensively than any other species, but mainly for windbreaks and fuel. The recent experiments with this species, made by the Forest Service in coöperation with the State, show that its mechanical properties are not unlike those of second-growth hickory. This fact has directed attention to the possibilities of growing it for furniture, implement and wagon stock, etc.

Experiments have also been made which prove that this species can be impregnated with a preservative very simply and cheaply. Time enough has not elapsed to show the comparative length of life of treated and untreated timber, yet judging from the known effects of preservatives on other species it is safe to predict that the life of treated timber will be multiplied two or three times. If this is the case the near future will see extensive plantations of eucalyptus for the production of railroad ties, fence posts, telephone and telegraph poles, piles, etc. The Santa Fé Railroad Company has recently purchased a ranch of 8,330 acres near San Diego, where it will produce material for its own use.

While a great deal of attention has already been given the production of blue gum, very little has been devoted to other species. The sugar gum (*E. corynocalyx*), while of somewhat slower growth than the blue gum, produces a much more shapely bole, especially for tie, pole, and post use, and will thrive with less moisture. Under proper care in the beginning there seems no reason why extensive plantations of this species should not be made over the lower foothills. Many other species of eucalypts deserve attention.

Another possibility worth considering is the establishment of the naval stores industry in California. By the introduction of the "cup and gutter" system in the southern pineries the Forest Service has completely revolutionized the methods of turpentining. Under the new system the damage to the forest has been reduced to a minimum, and at the same time the product has been increased over 25 per cent. Recent analysis of crude resin collected from California give from 20 to 22 per cent of turpentine, which is 1 or 2 per cent above the average yield from the standard turpentine pines of the South.

COUNTY CO-OPERATION.

As stated elsewhere, there are ten counties coöperating with the State for fire protection. These are San Diego, Riverside, San Bernardino, Los Angeles, Santa Barbara, Kern, Tulare, Fresno, Santa Cruz, and Tuolumne. They deserve all credit for willingness to do what the law permits.

According to the plan most generally followed the county supervisors appropriate from the general fund a sum sufficient to pay citizens 25 or 30 cents an hour for actual services performed in extinguishing fires. The amounts appropriated vary from $500 to $1,000, depending on the size of the county and its financial condition. The supervisors then recommend such citizens for appointment as fire wardens as they desire, and on this recommendation the men are immediately appointed. Each fire warden is furnished with a badge, book of burning permits, a supply of law circulars for distribution, and a number of warning notices for posting.

Another plan, followed by Los Angeles, Santa Barbara, and Santa Cruz counties, is to increase the salary of the game warden and make him chief fire warden, with patrol duties. The chief fire warden then recommends the names of citizens whom he wishes appointed.

Of the two plans the latter is by far the more effective, because there is then a man who has partial control of the system and some sort of organization results. Where fire wardens are appointed at the request of supervisors, absolutely no organization is secured. A fire warden works or not as he wants to, and submits his bill to his supervisor for payment. The State Forester has absolutely no control over either system, can give no aid except on request, and offer only suggestions, which the fire wardens may follow or not as they choose. Usually the posting of warning notices is the only attempt made to prevent fires. If a fire occurs in a grain field or pasture, vigorous efforts are usually made to check it. This is no advance, however, for property owners did this before the office of fire warden was created. If chaparral on a watershed is burning little attention is paid to it, for few understand its importance.

To sum up, neither system does harm and may do good, depending entirely upon the personal equation of the fire wardens. This is exactly what must always be expected from lack of organization.

In the matter of arrests the systems are even less satisfactory. Usually fire wardens are engaged with other duties and know nothing about a fire until it has a good start and the one who caused it, if a hunter or camper, has had ample time to escape. If caused by a resident on friendly terms with the warden, the offense is overlooked. Should their relations he strained for any cause, however, an arrest usually follows, after which a conviction depends entirely upon whether the offender will plead guilty. If not, the warden is usually too busy to collect evidence, and the case is dropped. In other words, personal considerations usually determine the action taken.

Moreover, the provisions of the laws militate directly against the interest of magistrates. No county magistrate can be expected to involve the county in expense to collect a fine which must be forwarded to the State. If a flagrant case is called to a magistrate's attention, and no excuse exists for failure to prosecute, he ordinarily takes the action commanded by law. If any excuse exists, or can be created, the case is overlooked. Here both personal and political considerations determine results.

To sum up, county coöperation is about the weakest possible excuse that can be conceived for an organization in any way capable of securing immunity from fires. And it will continue to be so long as the county is required to do, unaided, work which benefits both the county and State. Any attempt on the part of the State to urge county officials to greater efforts immediately strengthens their aroused suspicions that the State wants more money from fines. Before anything resembling satisfactory protection is secured the State must assume equal expense with the counties, share the fines equally, and retain the right to direct the work of salaried men with no other but warden's duties. The forest bill appended to this report differs from the present law principally by providing patrolmen. Too strong emphasis can not be placed upon the fact that unless this machinery for enforcing the laws and preventing fires is secured the usefulness of the State Forester will soon end. County coöperation under present conditions is intolerable.

The State can exercise the control which its duty demands only by amending the laws and making financial provision to insure protection. At present the State Forester can not incur expense to prevent and extinguish fires, even in emergencies and where such action would go far to strengthen public approval. He can not hire a man to enforce the punitive laws, although failure to enforce them frequently results in contempt and disbelief in their force and efficacy. Even the very cost of trial and punishment must be borne wholly by the counties. In effect, this means that the State has recognized its duty to the extent of imposing certain laws on the counties without their consent, but stopped there, and not only left the entire burden of prosecuting on them, but expected them to voluntarily increase this burden by paying fire wardens to hunt up trouble. It may be contended that the same is true with regard to other penal laws, but there are two differences: the counties are expected to maintain a fire warden force in addition to the ordinary judiciary machinery, and they are not permitted to retain the fines collected.

FOREST FIRES.

Before discussing the principal causes of forest fires or the means of preventing them, it will be instructive to consider briefly their effects on the following classes of land:

1. Virgin forest land;
2. Culled forest land;
3. Clean-cut forest, or brush land.

On virgin forest land fire destroys all ground cover and reproduction, and in the case of a top fire destroys even the larger trees. A slower fire will burn through the bark at the base of the trees, in the case of firs and pines, and destroy the cambium, thus killing the tree. In redwood usually the second or third fire succeeds in getting through the bark and burning out what is known as a "goose pen" in the base. If there is a draught, or if the tree is hollow, the heart is burned out and a chimney results. In any case a high percentage of such timber must be rejected in lumbering, if, indeed, not all of it. Moreover, the destruction of the young growth delays for a long period or prevents entirely the starting of a second crop, depending on the extent of the fire and the proximity of unburned areas from which seeds may come.

On culled forest land the soil and humus covering is burned from the bases of the remaining trees and they are thrown by ensuing winds. The possibility of their seeding up the area is thus precluded. All small growth is consumed, together with the débris left from lumbering. leaving the soil exposed to erosive action. The fertile surface soil is generally lost before chaparral species have a chance to enter and prevent further erosion. Once the chaparral has secured possession the chances that a forest growth will follow are very meager, indeed.

On clean-cut forest or brush land the damage is entirely to the watershed. This consists first in the loss of all vegetable covering of the soil, and, second, the erosion of the soil itself. Successive fires effect the removal of all soil, so that the rock is exposed and no further chance remains for even the hardy chaparral species to cloak the ground.

Causes of Fire.

Data on the principal causes of forest fires have been gleaned from 120 reports made by fire wardens in twenty-three counties during the past season. While such a limited number of reports from one season are not sufficient to establish reliable percentages, they will serve to indicate the principal sources of forest fires.

Cause.	Number.	Per Cent.
Sparks from engines	17	14.18
Clearing land	12	10.00
Camp fires	12	10.00
Lightning	10	8.33
Maliciousness	5	4.16
Logging	3	2.50
Unknown and *miscellaneous	61	51.02
Totals	120	100.00

Occurrence of Fires.

The percentage of fires by months is also interesting in this connection.

Month.	Number.	Per Cent.
May	2	1.66
June	11	9.17
July	31	26.31
August	35	29.15
September	18	15.00
October	22	18.34
November	1	.83
Totals	120	100.00

Fires burning 1,000 acres or more have occurred as follows:

Month.	Number.	Estimated Area Burned (Acres.)
June	1	1,000
July	5	7,480
August	3	42,100
September	6	54,900
October	7	44,840
November	1	2,000

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*Includes dropping lighted matches, cigars, cigarettes, fire crackers, sulphuring, etc.

While these data are very incomplete, particularly as regards the northern counties, reports showing the destruction of 650,000 acres outside the forest reserves have been received. Without considering the loss of material more valuable than watershed cover, one can readily see how necessary it is to reduce this annual loss to the State. In many cases, however, valuable timber has been lost, crops have been burned, cattle destroyed, and homes swept away, which men have spent years in accumulating.

Prevention of Fires.

Forest fires should be prevented just as any other crime against society, namely, by enacting laws restricting the dangerous use of fire under penalty, and by employing officers whose sole duty it is to see that the laws are obeyed. The State has taken legislative action in this direction, but has failed to provide executive machinery. Until this is done the forest laws will remain unused, except in particularly flagrant cases. Experience has proven adequately enough that other laws are not automatic. Why should the forest laws be an exception?

Moreover, there is no logical reason to expect men throughout the State to accept appointments as fire wardens and fulfill the prescribed duties when such action will cause trouble to a neighbor. It has followed in practically every case that men so appointed have performed yeomen service in distributing circulars containing the laws, in posting warning notices, and in fighting fires, but seldom has one been found who will cause his neighbor trouble. This is readily understandable when one considers that the desire for the esteem of one's fellow men is one of the strongest factors determining human behavior. Furthermore, the daily duties of voluntary fire wardens preclude the possibility of their giving attention to preventing fires. One is rarely found who will not use every effort and even incur personal expense, besides loss of time, to extinguish one already burning, but prevention is not emphasized, except as the law circulars distributed and the warnings posted increase public caution.

FIRE WARDENS.

There are 367 citizens in the State who have accepted appointments as fire wardens. Of these, 136 are volunteers, 128 are employed by the Forest Service, and 103 are paid by the counties in which they reside for actual services performed in extinguishing fires.

When appointed, every fire warden is required to take an oath of office, which in California costs him 50 cents. Thus it will be seen that the volunteer wardens and those employed by the Federal Government have actually paid for the privilege of being fire wardens, for which they can receive no compensation. Does the State appreciate such loyal service? County wardens also deserve great credit, for they are paid only for time actually spent in fighting fire, though most of them devote a considerable amount to posting notices, for which there is no compensation. The fire wardens are located as follows:

County.	Number.	County,	Number.
Alameda	14	Placer	5
Butte	17	Plumas	12
Calaveras	4	Riverside	14
Colusa	1	Sacramento	2
El Dorado	3	San Bernardino	38
Fresno	7	San Diego	33
Glenn	3	San Joaquin	1
Humboldt	2	San Luis Obispo	8
Inyo	1	Santa Barbara	14
Kern	25	Santa Clara	3
Lake	2	Santa Cruz	13
Lassen	1	Shasta	4
Los Angeles	45	Sierra	3
Madera	8	Siskiyou	21
Marin	2	Sonoma	10
Mendocino	1	Tehama	2
Modoc	6	Trinity	9
Mono	2	Tulare	8
Nevada	11	Tuolumne	6
Orange	1	Ventura	5

Although it is unreasonable to expect unpaid men to display much activity in extinguishing fires which do not endanger their own lands, fire wardens have done good work on 76 of the 120 fires reported.

ARRESTS AND CONVICTIONS.

From the following list an idea can be gained of the attempts made to enforce the punitive laws and the localities most active in this respect. The preponderance of arrests in San Bernardino County is not an index of greater criminality there, as might be supposed at first glance, but of the energetic efforts of the Forest Supervisor, backed by public sentiment. The names of the offenders are withheld.

No.	County.	Law Violated.	Magistrate.	Action.
1	Calaveras	Stats. 1905, Sec. 16	Justice Marsh	Case dropped.
2	Los Angeles	Stats. 1905, Sec. 16	Justice Pierce	Fined $50. Sentence.
3	Los Angeles	Stats. 1905, Sec. 16	Justice Crawford	Fined $50.
4	Los Angeles	Stats. 1905, Sec. 14	Justice Crawford	Fined $50.
5	Mono	Penal Code, Sec. 384	Justice Montrose	Fined $10.
6	Placer	Stats. 1905, Sec. 16		Pending.
7	Plumas	Stats. 1905, Sec. 17	Justice Hughes	Pending.
8	Santa Cruz	Stats. 1905, Sec. 16	Justice Page	Fined $50.
9	San Diego	Stats. 1905, Sec. 14	Dist. Att'y Carter	Pending.
10	San Diego	Stats. 1905, Sec. 14	Dist. Att'y Carter	Pending.
11	Santa Clara	Stats. 1905, Sec. 16	Dist. Att'y Campbell	Pending.
12	Siskiyou	Stats. 1905, Sec. 14	Dist. Att'y Luttrell	Case dropped.
13	Siskiyou	Stats. 1905, Sec. 14	Dist. Att'y Luttrell	Imprisoned during earthquake holidays.

No.	County.	Law Violated.	Magistrate.	Action.
14	Siskiyou	Stats. 1905, Sec. 10		Case dropped.
15	San Luis Obispo	Stats. 1905, Sec. 16		Pending.
16	Sacramento	Penal Code, Sec. 384		Pending.
17	San Bernardino	Penal Code, Sec. 384*b*	Justice Paddock	Fined $5.
18	San Bernardino	Penal Code, Sec. 384	Justice Paddock	Fined $10.
19	San Bernardino	Stats. 1905, Sec. 14	Justice Paddock	Fined $50.
20	San Bernardino	Stats. 1905, Sec. 15	Justice Belden	Fined $50.
21	San Bernardino	Stats. 1905, Sec. 16	Justice Glover	Fined $50.
22	San Bernardino	Stats. 1905, Sec. 16	Justice Gifford	Pending.
23	San Bernardino	Stats. 1905, Sec. 16		Pending.
24	San Bernardino	Stats. 1905, Sec. 14	Dist. Att'y Sprecher	Fined $50.

As shown above, $425 has been collected from the 16 cases disposed of. Those pending will probably yield $200 more.

The minimum fine has been imposed in every case, so far as known. Some hesitancy has been evinced by magistrates to imposing a fine so large as $50, and had the offenders not pleaded guilty it is doubtful if so many convictions would have been secured. A fine of $25 is punishment enough for the ordinary violator. This represents a distinct loss great enough to induce caution in future, but does not become a severe burden. For this reason the minimum fine should be reduced to $25 in Sections 14, 15, and 16.

DESIRABLE CHANGES IN THE FOREST LAWS.

In order to accomplish the ends for which they were designed and become workable, the forest laws should be changed along three distinct lines:

1. Broadened, to include machinery for the enforcement of the legislative provisions.
2. Adjusted, to fit other laws by eliminating portions providing for action already covered by laws previously enacted or portions in direct conflict with provisions of prior laws.
3. Clarified, by avoiding references to subjects not germane to the particular theme under treatment.

The future efficiency of the laws will depend entirely upon whether machinery for the enforcement of the legislative provisions is granted. The last Legislature deemed a period of education a necessary step before commencing active work. That period is drawing to a close and the results of agitating rational forestry are apparent. This report is unnecessary to make the fact known that people in all quarters are taking a more active interest in forestry than ever before, because they understand its aims. Certain lumbermen, who two years ago assumed a helpless attitude toward fires, are now casting about hopefully to find the best means to protect their property. Others who formerly declared fires did little harm and were usually not very destructive now speak of the enormous loss caused by the destruction of young growth. In other cases the loss of watershed cover is lamented. Mention is made of the lesser volume of streams now than formerly, and the reason for it is recognized. More and more attention each year is being given to the utilization of inferior species and by-products. People are becoming satisfied with poorer grades and smaller dimensions, and timber owners, realizing this, are giving more thought to general protection. Increasing number of landowners are asking advice on planting forests for supplies and protection. In other words, the fundamental steps for the success of the forestry movement have been taken. Further development is necessary in some quarters, but this may safely be counted on to accompany actual work, which should begin while the people are expectant.

To provide immunity from fires salaried patrolmen should be distributed over the State, whose sole business is to prevent and check fires. The State Forester should decide where the greatest need for protection exists, should be given authority to employ patrolmen, and held absolutely responsible for results. This will necessitate the districting of the State and the securing of district fire wardens. It is estimated that twenty can be used at once and more as soon as the results of the work are demonstrated. Only district fire wardens should be empowered to compel assistance in putting out fires. This work should be paid for at the uniform rate of 25 cents per hour, just as men who do similar work on forest reserves are paid. Where counties are large, or the means of travel are primitive, each county should be made a separate district. Under opposite conditions, two or three counties should be grouped. In some cases it may be advisable to ignore political units and follow natural divisions.

Where one county forms a separate fire district it should be assessed one half the cost of patrol and in addition one half the expense incurred by securing assistants to put out fires. Counties now pledged to coöperation will doubtless be glad to abandon the present lax system for a practical plan of this kind. Others, who have looked with disfavor on the old scheme, will fall in line. There will always be a few, however, who will be opposed to any plan. When this condition obtains, yet protection is necessary. The State should be empowered to provide protection and assess the district for its share of the expense. When counties are willing to meet the State half way the net returns of fines collected should be divided equally. But if the county or counties composing a district needing protection will not coöperate, the entire sum collected by fines should be taken by the State.

In addition to salaried patrolmen, reliable citizens desiring the powers of fire wardens should be appointed, but should not be given authority to compel assistance, except in the case of forest reserve officials. The payment of men summoned by reserve officials will be made by the Federal Government.

To prove the State's belief in its own teachings, executive machinery should be supplied to meet the increasing number of applications for technical advice along the lines of replacement and management. One technical assistant is an immediate necessity for the work.

Certain sections of the Act of 1905 are almost identical with sections of the Penal Code. Hence, local magistrates may choose which law they will follow in prosecuting. This is true of Section 14, which differs but slightly from Sections 384, 384*a*, and 600 of the Penal Code. Likewise, Section 15 is like Section 384*b* of the Penal Code and Section 3, Stats. 1875-6: 408. To avoid confusion the Penal Code should be amended to include whatever additional provisions are necessary, instead of having certain parts almost duplicated in the forest laws, as at present.

The necessity for clarifying sections to avoid reference to subjects not covered by the Act of 1905 exists particularly in Section 3, where the Mount Hamilton tract and the Chico and Santa Monica experiment stations are alluded to, although none of them are governed by the State Board of Forestry. This ambiguity should be removed, having reference only to California Redwood Park and providing for the administration of any forest tracts which may be acquired later.

These recommendations are incorporated in the proposed legislation appended to this report.

SUMMARY OF CONCLUSIONS.

The effect of settlement and development on the forests of California has been to reduce the area of merchantable timber very materially, leaving the area of actual forest land practically unchanged. The temporary reduction of the merchantable area, caused by lumbering, becomes permanent when lumbering is followed by successive fires, which prevent the reproduction of tree species and cause the invasion of chaparral.

The sale of forest products produces an immense annual revenue, hence forest protection, so that complete utilization may accrue, is imperative.

The denudation of watersheds is always followed by floods and drought. This matter is particularly vital in California, where every other industry is directly dependent on a cheap and abundant supply of water.

The State is the arbiter of present and the guardian of future generations. Its function is to preserve present resources, not only for present use, but also for future use. In the case of the forest, it should take effective action to prevent losses by fire.

The State has in the past made sporadic and half-hearted attempts to practice forestry, but with little success until 1903, when a contract with the Forest Service was made for a thorough study of forest conditions and the formulation of a State forest policy. The Act of 1905 was based on conclusions thus obtained, but owing to amendments its usefulness was greatly impaired. As enacted, it amounted simply to a propaganda instrument, without machinery to enforce its provisions.

The attitude of certain elements toward forestry was cordial from the beginning. Others have been won over, until now there is widespread sentiment for forestry practice.

Technical forestry has been commenced, and the possibilities of extensive work are limited only by lack of technically trained assistants.

Ten counties have appropriated sums for the payment of wardens. Others are deterred only by the inconsistent attitude of the State as expressed in its coöperative offer. Owing to lack of control, poor organization has followed and small results have been secured.

The forest laws should be broadened to include machinery adequate to cope with forest fires; adjusted to other laws, and clarified to eliminate ambiguous references.

EXPENSES OF STATE FORESTER'S OFFICE,

July 1, 1906, to October 31, 1906.

Salaries	$1,695 00	
Traveling expenses	710 62	
Printing and stationery	402 75	
Postage	83 00	
Office rent	57 35	
Incidentals	197 91	
Total		$3,146 63
Annual appropriation	$8,800 00	
Unexpended balance from fifty-seventh fiscal year	4,449 53	
Total		13,249 53
Balance		$10,102 90

CALIFORNIA REDWOOD PARK.

The California Redwood Park represents a public investment of a little over $250,000 and a public benefit many times greater. It is the only retreat within easy reach of the population centers of the State that combines unexcelled natural beauty with unrestricted freedom at an expense within the means of all classes of people. Moreover, its benefits, although widely enjoyed now, will attain increasing importance as urban populations become larger and rural regions become fewer. To meet these growing demands the California Redwood Park must be administered to insure its permanent usefulness by protecting it from destruction by fire and improving it as rapidly as public needs demand.

Protection.

In keeping with this policy, the administration of the park has been directed toward securing immunity from fire before attempting other than the most pressing improvements. About 28 miles of fire lines, varying in width from 30 to 60 feet, have been cleared. These lines now encircle the park, excepting for a distance of approximately 1½ miles, which will be cleared this winter. The fire lines have followed the rim rock of the basin and smaller spurs practically all the way. In places this necessitated clearing on private lands outside the park, in which cases the owners have exhibited a gratifying willingness to aid in the work, both as a public service and because partial protection to their own property resulted. Some have contributed labor and others money toward the work. No fires have crossed the park boundaries during the last two dry seasons.

In constructing the fire lines last year an attempt was made to cover as much ground as possible. As a result, the early work was hastily done and will need to be gone over again. A strip several feet wide was grubbed along both sides of the fire lines, but in the middle the brush was cut but not grubbed, the idea being that when the material piled along the middle was burned the heat would kill the stumps and prevent coppice from springing up. This did not follow, however, hence these lines now have a strip of young brush through the middle, on both sides of which the line is open. In some cases, too, the lines were left too narrow in places, owing to the haste to get around the basin. Before these lines are fully satisfactory the stumps will need to be grubbed from the middle and the width of the line increased.

This year it was possible to give more time to the work, and greater permanence has resulted. All species except tanbark oak and redwood have been cut and grubbed from the lines, together with all trees of these two species that were deformed or less than 8 or 10 inches in diameter. The brush has been piled in a windrow along the middle of the line, where it will be burned at favorable times, when dry.

In addition to the fire lines surrounding the park, several short secondary lines from 20 to 40 feet wide have been cut along cross spurs inside the park, to form further barriers in case a fire crosses one of the outside lines. Strict watch over campers and visitors is kept by the warden and other employés, to guard against an outbreak within the park. A supply of fire-fighting tools is kept on hand.

The fire lines are not intended to be automatic, except the fire is slow, but to serve as vantage points along which to fight a fire or from which back-firing can be done safely. When the present system of fire lines is completely cleared of material only unusually fierce fires need cause any great apprehension.

In view of the density and large size of the timber through which the fire lines have been cut, the cost of clearing and grubbing has been moderate at about $150 per mile. Approximately 18¼ miles were cleared during the last fiscal year, at a total cost of $2,744.90. Those cleared since July 1 have cost somewhat more, because of the greater care taken to render them permanent. At the present time the fire lines are costing close to $175 per mile.

Future Protection.

The presence of workmen on the rim surrounding the park has obviated the necessity of keeping men stationed at prominent points to give warning of fires from which damage might result. When the fire lines are completed it will be necessary to keep three or four men at work along them during the dry season, to maintain a lookout. Each beat should be connected with the warden's headquarters by telephone, so that he can be warned at once if a fire is approaching. The cost of installing and maintaining this signal system will be very small, for wires can be strung on the smaller trees and the men can be profitably employed in keeping the lines cleared of grass and weed growth. The utmost vigilance will be necessary, during the next three or four years in particular, for several companies owning timber adjacent to the park are about to commence lumbering.

Improvements.

Despite the fact that protective measures have been given first attention, several important improvements have been made since July 1, 1905, when the State Board of Forestry assumed the administration of the park.

Of first importance was the construction of about ½ mile of road from Sempervirens Camp to Flea Potrero, and the widening of the road from Sempervirens Camp to Governor's Camp. This road is from 16 to 20 feet in width at almost all points, and built on a uniform grade not exceeding 6 per cent. Permanent repairs have also been made on two large slides and several small ones caused by heavy winter rains. A thoroughly good job was done in widening the road, making it possible for teams to pass at almost any point.

The permanent buildings at the park have been increased by the erection of a substantial log barn at the entrance and a combination tool and bunk house at Governor's Camp. The former was built of unhewn redwood logs of uniform size, and has been much admired by visitors. The latter, although less elegant in appearance, has supplied a needed shelter for tools and employés.

Several new trails and improvements to old ones have opened up the park to such an extent that visitors stopping several weeks in the park always find new places to visit. Considerable work of much importance, although less noticeable, has been done to rid the camping sites of dead brush, fallen limbs, and poison oak.

At the present time two important jobs are under way. One is the construction of a private telephone line from Boulder Creek to Governor's Camp; the other, a survey of the park boundaries. The telephone will supply a long-felt need for communication with neighboring towns, for assistance in case of fire and for the use of visitors to the park. The survey will define the boundaries and enable fencing to be done in some places against straying stock. The boundary lines will be cleared of brush and furnished with guideposts wherever crossed by trails.

Improvements Projected.

In addition to the lines of work now under way, the principal improvements scheduled for the immediate future are the construction of a lodge for the warden, the installing of a water system for Governor's Camp and the warden's lodge, and a road-sprinkling system.

The warden's lodge will be built at the park entrance opposite the new log barn, on a five-acre tract donated to the State for this purpose by Mr. H. L. Middleton. Plans for the lodge have been submitted and considerable material has been gotten out in preparation for its erection early in the coming summer.

In view of the fact that water for household uses can be obtained in the park only by carrying it from the streams and other means quite as primitive, and especially since companies owning the timber in the upper watershed of the stream from which the supply is obtained are preparing to begin cutting, it becomes necessary to install a permanent system for camp use. Abundant water of excellent quality can be obtained from a living spring a short distance above Governor's Camp. This work should receive attention during the coming summer.

It will be necessary also to obtain water for use at the warden's lodge before it is occupied. Here the water will have to be raised from the creek below, consequently an engine and pump will have to be put in. A tank should be erected above the lodge to hold water for use in emergencies.

Desirable Improvements.

There is pressing need of a moderate-sized hotel inside the park, where employés may board and visitors may obtain accommodations.

The present lack of accommodations burdens the warden with the responsibility of boarding employés and very often providing for visitors. This is undesirable, because it is liable at any time to arouse criticism on the ground that the warden is making a profit from keeping a boarding-house. More important from the standpoint of the State, however, is the fact that this work takes up some of the time which the warden owes the State. The only way to remedy the situation is to induce some hotel-keeper to open a hotel there. This is of immediate importance.

Quite a large area near the eastern side of the park was burned over in 1904 and many large redwood trees were killed. These should be cut in order to improve the appearance of the park and to remove the danger from falling limbs. At present all money obtained from the sale of such material must be turned into the general fund. If this clause is amended by the coming Legislature to permit the proceeds from such material to be reinvested in the park, steps should be taken immediately to dispose of all dead timber. Probably the most satisfactory way will be to set up a small mill on the tract, temporarily, and cut the lumber into shingles.

Visitors.

During the past summer the park has been visited by about half the normal number of people. This reduction is attributable to the earthquake which destroyed the tunnels on the narrow-gauge railroad from San Francisco to Santa Cruz, causing the road to be blocked all summer, and to the partial destruction of the City of San Francisco. Fewer people have cared to take the trip since it has been increased by the long detour via San José, and fewer from San Francisco have been in a position to afford recreation. There is no doubt that the opening of this road and the betterment of conditions in the city, which will prevail next summer, will bring the number of visitors up to those of former seasons, at least.

During the summer months a daily stage was run from Boulder Creek to Governor's Camp by W. M. Elsom, under permission from the State Board of Forestry.

Further Acquirement of Land.

The north boundary of the park is indented by a half-section of private land, known as the Harrington claim, owned by the McAbee Brothers Timber Company. This is largely good redwood, very attractive scenically, and especially important as the source of one of the main streams which traverse the park. It could not be acquired when the park was purchased, because one of the joint owners refused to sell.

Now, however, it can be acquired, and should be if a reasonable price will be accepted, for it is useless to the owners for any purpose but logging, and this would damage the park immeasurably.

Between the park and the coast are several parcels of vacant Government land of too small commercial value to have attracted claimants. Senator Perkins has been asked to induce Congress to grant these to the State as additions to the park. This project should be agitated, for eventually the intervening lands can be secured at a small price after being logged, and reforested by a few years' protection, then the whole will make a most valuable addition to the park. This is desirable, not only to increase the area, but to perfect control and thus be able to guard the more valuable portions from outside fires and loss of wild game.

EXPENSES OF CALIFORNIA REDWOOD PARK.

July 1, 1906, to October 31, 1906.

Warden's salary	$500 00	
Labor on fire lines	1,315 79	
Labor on clearing	345 75	
Labor on telephone line	258 50	
Supplies, tools, lumber, etc.	165 06	
Labor on lodge material	92 40	
Repairs	35 75	
Total		$2,713 25
Balance July 1, 1906		11,389 13
Balance November 1, 1906		$8,675 88

SECOND BIENNIAL REPORT

OF THE

STATE FORESTER

OF THE

STATE OF CALIFORNIA.

SACRAMENTO:
W. W. SHANNON - - - - - - - - - - - Superintendent State Printing.
1908.

STATE BOARD OF FORESTRY.

JAMES N. GILLETT	Governor.
C. F. CURRY	Secretary of State.
U. S. WEBB	Attorney General.
G. B. LULL	State Forester.

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REPORT OF THE STATE FORESTER.

STATE CAPITOL, SACRAMENTO, November 30, 1908.

To His Excellency, JAMES N. GILLETT, *Governor of California.*

SIR: I have the honor to submit herewith my second biennial report on the work of the State Board of Forestry from October 31, 1906, to October 31, 1908.

During the past two years the business of the State Forester's office has increased beyond all expectations. Four years ago the State of California, with a forest area of 66,000,000 acres, had no State Forester and no clear idea as to what the business of forestry meant to accomplish. In July, 1905, by an act of the legislature, the State Board of Forestry was created, largely as an experimental measure. Its duties as outlined in the creating act were to conduct an educational campaign in forestry, to coöperate with timber landowners in the management of their property, to encourage landowners to plant trees, and to enforce the legal provisions relating to the use of fire.

I believe this report will show conclusively that this experiment has proven successful. It will be my aim to set forth the results accomplished in the way of forestry education, to show the results of our work to control forest fires, and to describe the advancing interest in tree planting to a position which entitles it to recognition as a coming staple industry of the State. These results, having been accomplished under an appropriation wholly disproportionate to their value to the State, indicate the possibilities to be attained if an appropriation be made now of sufficient size to encourage the hope that we may be able to handle our growing affairs.

REVIEW OF WORK DONE.

Forest Protection.

In my report two years ago the problem of protecting the forest from fire was indicated as the most important work before the State Board of Forestry. During the past two years, and particularly during the past summer, the need for more facilities to handle this great problem has been strongly emphasized.

The boundaries of the national forests of California, administered by the Forest Service of the Department of Agriculture, include an area approximately 23,000,000 acres. They include, however, large areas of private land upon which the forest officers have jurisdiction in case of fire only through their appointments as firewardens by the State. Hence these areas may be considered as being under State protection. Outside the National Forests the great mountainous area of the State, as well as the areas devoted to grazing and agriculture, are under State protection.

The act creating the State Board of Forestry provides that the State Forester may appoint firewardens, who shall have power to arrest for violation of the sections prohibiting the use of fire, to grant or refuse burning permits during a dry season, without which burning is unlawful, and to compel the assistance of citizens in fighting fires. Under this act 721 firewardens have been appointed. They are located as shown in the following list:

County.	Total Number of Firewardens.	Number Employed by Forest Service.	Number Employed by Counties.	Number of Voluntary Firewardens.
Alameda	24	0	0	24
Amador	2	1	0	1
Alpine	1	1	0	0
Butte	25	0	0	25
Calaveras	12	4	0	8
Colusa	2	1	0	1
Del Norte	1	0	0	1
El Dorado	6	3	0	3
Fresno	19	5	3	11
Glenn	8	4	1	3
Humboldt	8	3	0	5
Imperial	1	0	0	1
Inyo	7	7	0	0
Kern	34	7	20	7
Lake	16	2	0	14
Lassen	3	3	0	0
Los Angeles*	88	37	17	33
Madera	10	7	2	1
Marin	6	0	0	6
Mariposa	2	2	0	0
Mendocino	6	0	0	6
Merced	1	0	1	0
Modoc	7	7	0	0
Mono	1	1	0	0
Monterey	10	8	0	2
Napa	2	0	0	2
Nevada	14	5	0	9
Orange	6	0	0	6
Placer	17	4	0	13
Plumas	17	12	0	5
Riverside	30	21	3	6
Sacramento	4	0	0	4
San Benito	13	1	0	12
San Bernardino†	47	27	11	8
San Diego	47	8	27	12
San Joaquin	1	0	0	1
San Luis Obispo	16	4	0	12
San Mateo	3	0	0	3
Santa Barbara	22	16	5	1
Santa Clara	6	0	0	6
Santa Cruz	16	0	10	6
Shasta	14	5	0	9
Sierra	7	2	0	5
Siskiyou	30	11	0	19
Sonoma	12	0	0	12
Stanislaus	1	0	0	1
Tehama	7	2	0	5
Trinity	12	11	0	1
Tulare	40	17	17	6
Tuolumne	24	10	10	4
Ventura	10	9	1	0
Yolo	1	0	0	1
Yuba	2	1	0	1
Totals	721	269	128	322

* One Firewarden paid by "Committee of Nine," of Azusa, Cal.
† One Firewarden paid by city of San Bernardino.

It will be noticed that 269 firewardens are employed by the Forest Service. This number covers the forest officers whose appointments have been requested by the Forester to enable them to handle violations of the forest laws of the State.

Also, that 128 are employed by thirteen counties. This results from the fact that these counties have taken advantage of section 33½ of the County Government Act to appropriate money from the general fund of the counties to secure fire protection.

Three hundred and thirty-two are volunteer firewardens; these men serve without any pay. In all cases they have requested appointments as firewardens to aid them in the protection of their own or their employers' interests.

On appointment each firewarden is furnished a badge, a letter of instructions and book of burning permits, several copies of the State forest laws, a number of fire warnings printed on cloth, and blanks on which he is asked to submit a report on each fire that he attends or has definite knowledge of.

The right use by the firewardens of the material furnished results in an effective educational campaign. The letter of instruction acquaints the firewarden in a detailed way with the action he should take in bringing any violator of the forest laws to trial. He is impressed with the need of making due allowance for violations committed through lack of acquaintance with the law and instructed to refrain, so far as possible, from arousing friction. At the same time it is made plain to him that careless or criminal violations are to be prosecuted vigorously.

He is asked to apply for as many warning notices as he can use and instructed to post these conspicuously so that no one may remain unacquainted with the provisions against the use of fire. The extension of this information is carried still further by having the forest laws printed in separate circulars, which may be distributed to the public. Each firewarden is furnished with as many copies as he can place advantageously. Having the wardens distributed so widely over the State, as the list shows, the result is that at this time practically no one in the State is ignorant of the forest laws. That the knowledge of the law has a deterrent effect upon those who might otherwise be careless is certain. It is probable that many fire are prevented in this way.

Each firewarden is furnished with as many burning permits as he can use. These are furnished in books containing ten or twenty blank forms, which may be filled out quickly. The number used has varied greatly in different localities. Many firewardens have not used any; others have used as many as 300 or 400 in a single season. So far, we have had no fires escape where the provisions of the permit were followed, and that the permit would be followed is practically guaranteed by the fact that the one who desires to use fire makes a voluntary application for the permit. He thus directs attention to his operation, and could hardly escape punishment if he failed to follow the regulations and through his carelessness the fire escaped. The burning permit is a good way of impressing upon the public the need of using care with fires and has a great fire-preventive effect.

With the warnings posted thickly, the law circulars in the hands of the people, the duties of the firewarden consist in holding himself ready to consider impartially requests for burning permits. Each firewarden is furnished with a badge, which adds dignity to his appointment and impresses the public with the authority behind him. The law confers considerable authority upon the firewardens, and it might reasonably be anticipated that when they are chosen largely at random that some would be appointed who would misuse their authority. I have taken great pains to select the firewardens carefully, and in practically all cases require them to have their application for appointment endorsed by one or two well known citizens who are acquainted with them. This system of selection has worked well. Very few cases have come up where the firewardens have misused their authority to the detriment of the forest work.

From the fact that practically all the wardens have a business of their own to carry on it follows that they are not able to do much more than has been outlined. They are usually alert to extinguish fires as soon as they learn of their occurrence, and this doubtless prevents many fires from spreading to the extent they would if left unattended. But this does not operate to prevent fires, and therein lies the weakness of our present system.

In addition to the material mentioned each firewarden is furnished with blanks on which he is requested to make reports of the fires that come within his notice. These reports are due at the end of each month, or at the time the fire occurs, in case it is a large one.

The reports received during the past two years show that there have been 942 forest fires in California which burned over 394,496 acres and caused the death of two persons, besides a loss of $608,055.20 worth of property. Fourteen hundred and six burning permits were issued, and out of 45 prosecutions for violations of the forest laws, 32 conviction have followed, resulting in the collection of $775 in fines. This amount has been or will be covered into the State Treasury to the credit of the Forestry Fund. In addition 3 of those convicted have been sentenced to ten days each in the county jail and one to five months in the county jail. In one case the jury disagreed, but the case was not retried owing to the fact that it was taken up by the Federal Court where a trial resulted in its dismissal. Thirteen out of the 45 cases were dismissed.

Last spring the Forest Service offered, through this office, to coöperate with any county in which was situated a foothill forest adjacent to the National Forest boundary by putting up with the county a joint sum for fire protection purposes. This offer held good during the early part of the season, and during that time I was able to secure on this basis an appropriation from San Diego, Kern, Fresno, Madera, and Tulare counties sufficient for the support of two firewardens during the summer season. These firewardens were appointed by me, but worked under the supervisor of the forest in which the county area was situated. An equal number of men were added to the local force of the forest in each case. The result has justified the expenditure, and the system will continue next year if the Forest Service is able to make a similar offer.

In my last report I was able to show that San Diego, Riverside, Santa Barbara, Kern, Tulare, Los Angeles, Santa Cruz, and Tuolumne counties were appropriating money for the support of firewardens to protect their forest areas. Since then Santa Barbara has discontinued its coöperation, but the remainder are maintaining theirs, and in addition Merced, Glenn, Madera, and Santa Clara counties have appropriated money for this purpose. It is probable that this list could be increased considerably if we had sufficient force in the office to enable us to visit the supervisors of the different counties and urge the need of coöperation upon them. As it is, the supervisors meet but once each month, and on account of the distance from one county seat to another it is impossible to reach more than one or two counties during the short period they continue in session.

It will be apparent, without lengthy discussion, that our present system of controlling forest fires is faulty in many respects. Our only method of reaching violators of the forest laws is through the firewardens, and, except for the few instances I have mentioned, they act in a voluntary capacity without salary and without being reimbursed for their expenses. It is unnecessary to explain why I do not feel at liberty to call upon them to use their own time and funds in working up sufficient evidence to justify a prosecution. Yet it is evident that a man on the ground who is acquainted with the general features of the case could work up evidence less expensively than one who is detailed from the office for this special purpose. Moreover, we have not had the men or the funds to handle work of this kind except in cases where the evidence was readily gathered.

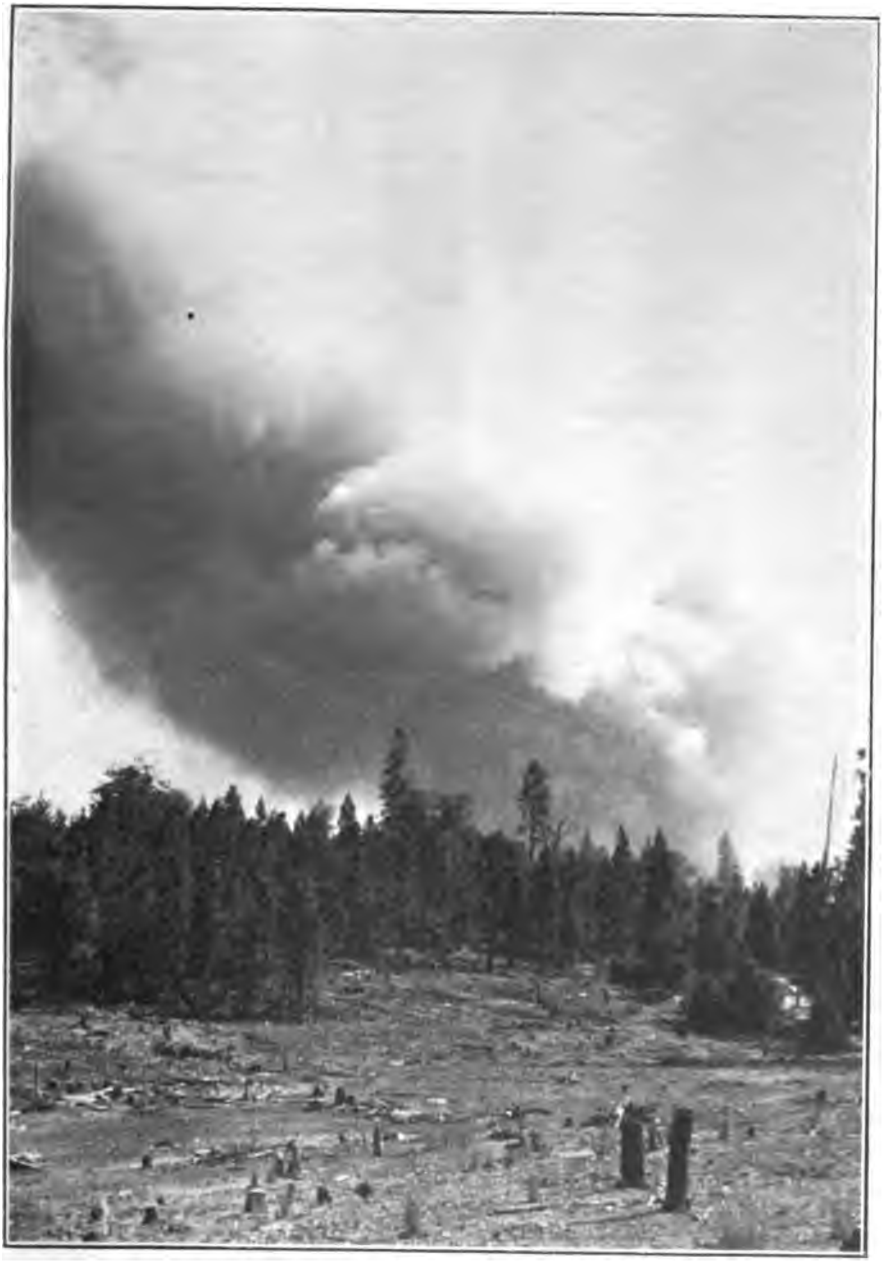
Obviously, if we had sufficient funds to pay a volunteer firewarden for his services when detailed on special work of this kind this would decrease the number of fires considerably. Yet there is imperative need of having a paid firewarden in each county who can give his entire time to patrol work during the dry season. In Santa Clara, Santa Cruz, Los Angeles, and Madera counties, where this system has been in operation during the past summer, there have been practically no fires of any consequence. This would seem to indicate that the system might be extended advantageously.

I believe if the county supervisors generally were approached with a proposition under which the State would pay one half of the expenses of a firewarden if they would appropriate funds to pay the other half, that the fire situation in California could be improved very greatly. The expenses to the State of a system of this kind in fifty of the fifty-eight counties should not exceed $15,000 per year, and the results should be a saving of property worth ten times this amount. It might be that this would not prove an effective system, but it promises so much in advantage of what we have at the present time that I submit it for your consideration. If we are able by this system, or any other, to prevent one fire a year of the magnitude of the Humboldt fire of last summer, the expenditure will have been more than justified.

A paid patrolman would be able to give his entire time during the summer season to patrol work. It would be his duty to travel through the county posting warning signs, distributing copies of the regulations regarding fires, issuing or refusing burning permits, as in his judgment appeared best, educating the people regarding the forest laws, taking charge of fires on their occurrence and gathering evidence against those responsible for them. He would be appointed by the State Forester and his work would be directed from this office. Each patrolman should own a horse, and should be equipped with fire-fighting tools. I believe efficient men for such work can be secured for $75 per month. It would not be necessary to employ them during the rainy season; consequently, I believe that it is safe to count on a period of six months each during which they should be employed. The length of this period will vary somewhat in different parts of the State, but its average will not differ greatly from this time.

Recommendations.

For the reasons I have given I recommend that a special appropriation be made for the purpose of fire protection with the understanding that whatever portion of this amount is used will be duplicated by the counties for the same purpose. It is evident that there is need of doing something to secure better control of the fire situation, and the plan I have outlined seems to promise the best results with the least expense.



FOREST FIRE IN TUOLUMNE COUNTY, AUGUST, 1908.

PROPOSED ORGANIZATION OF LUMBERMEN.

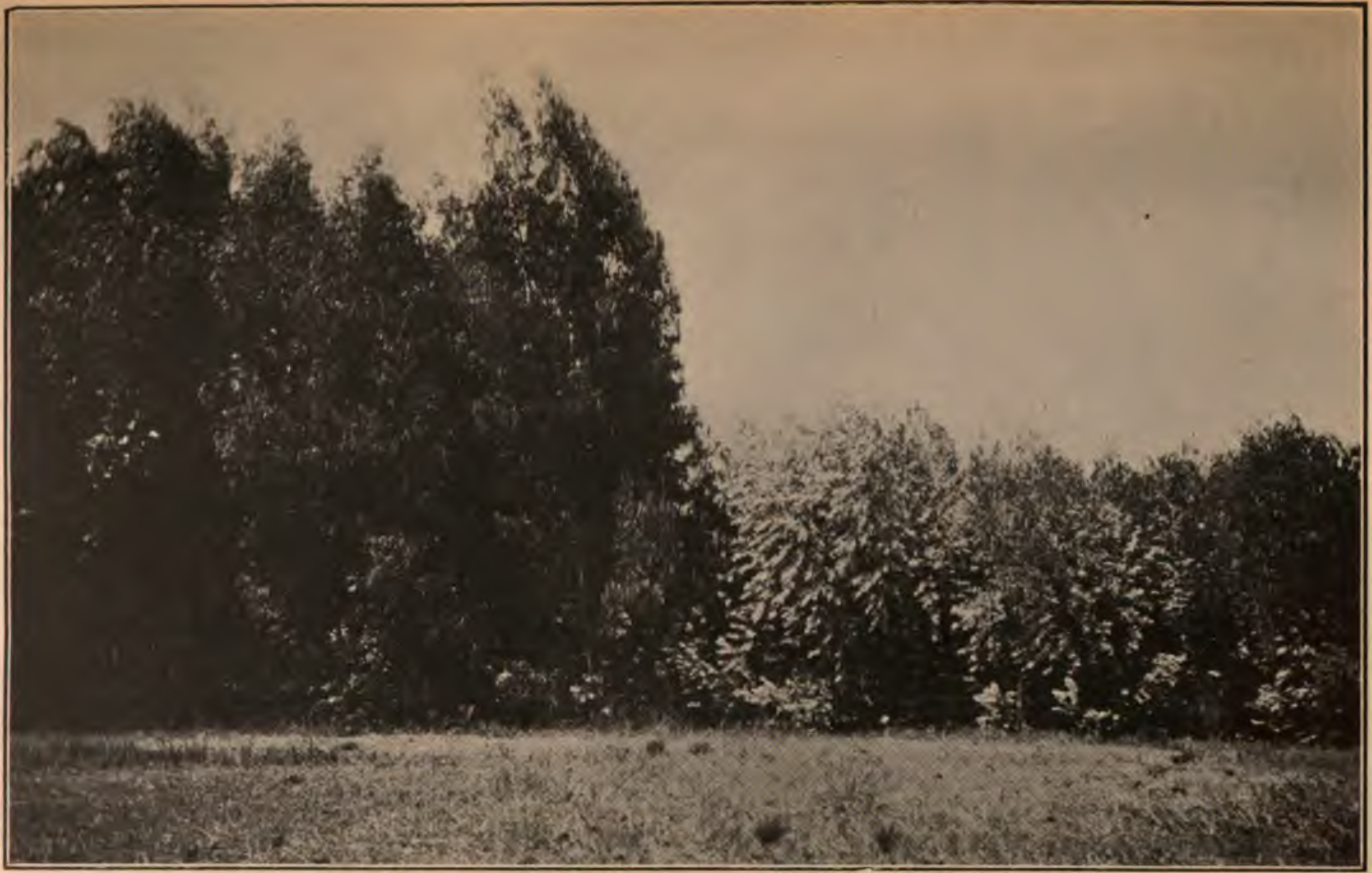
Several timber owners in the State have suggested the desirability of forming among California lumbermen an organization similar to the Washington Forest Fire Association. This association was incorporated under the laws of the State of Washington "for the preservation of the forests of the State of Washington generally, and particularly from loss by forest fire and the enlistment of the aid of the United States of America and the State of Washington in preserving said forests and preventing their destruction by fire." It has 138 members, representing about 2,600,000 acres of timber land, 75 per cent of which is represented by eight or ten companies. At the beginning of last summer the association levied an assessment of 1 cent per acre, the last half cent of which was called August 4th. This carried the association through the season, although an additional assessment of one half cent probably would have been necessary if the rains had not commenced early.

The timber owners were compelled to organize for this purpose on account of the insufficient appropriation by the legislature for fire protective purposes, it being only $7,500, which was just enough to maintain the office of State Forester and pay the salary and expenses of the deputies in the different counties.

The association had seventy-five men in the field from June 15th to September 15th, and accomplished a great deal. Its men were appointed rangers-at-large under the State forest laws. The association divided the State into districts, each man covering about four townships, more or less, according to the topography. It maintained seven inspectors, each one having charge of from seven to twelve rangers. The rangers were required to submit weekly reports stating where they went and what they did on each day. They were furnished with a badge and commission showing their authority, and were equipped with fire-fighting tools. Most of them were mounted on horses, though about twelve used wheels, and a few went on foot where the country was too rough to use either a horse or a wheel. Each man was required to notify the deputy firewarden of the county and the manager of the association in case he had a bad fire.

The total expenses of the association were about $4,000. They had a total of 1,102 fires, which burned over 18,753 acres, of which were 743 acres of timber, about one half of which was damaged.

From what I have learned of the sentiment of the timber owners in California, I believe it will be possible to effect an organization here similar to that in Washington. I shall make an attempt in this direction just as soon as time permits. If an association can be formed in California and a coöperative plan, such as I have outlined above can be put in force, the fire problem should become much less serious than at the present time.



TWO-STORY EUCALYPTUS FOREST, TREES AGED 4 YEARS AND 18 MONTHS, RESPECTIVELY, THE LATTER BEING SPROUT GROWTH.

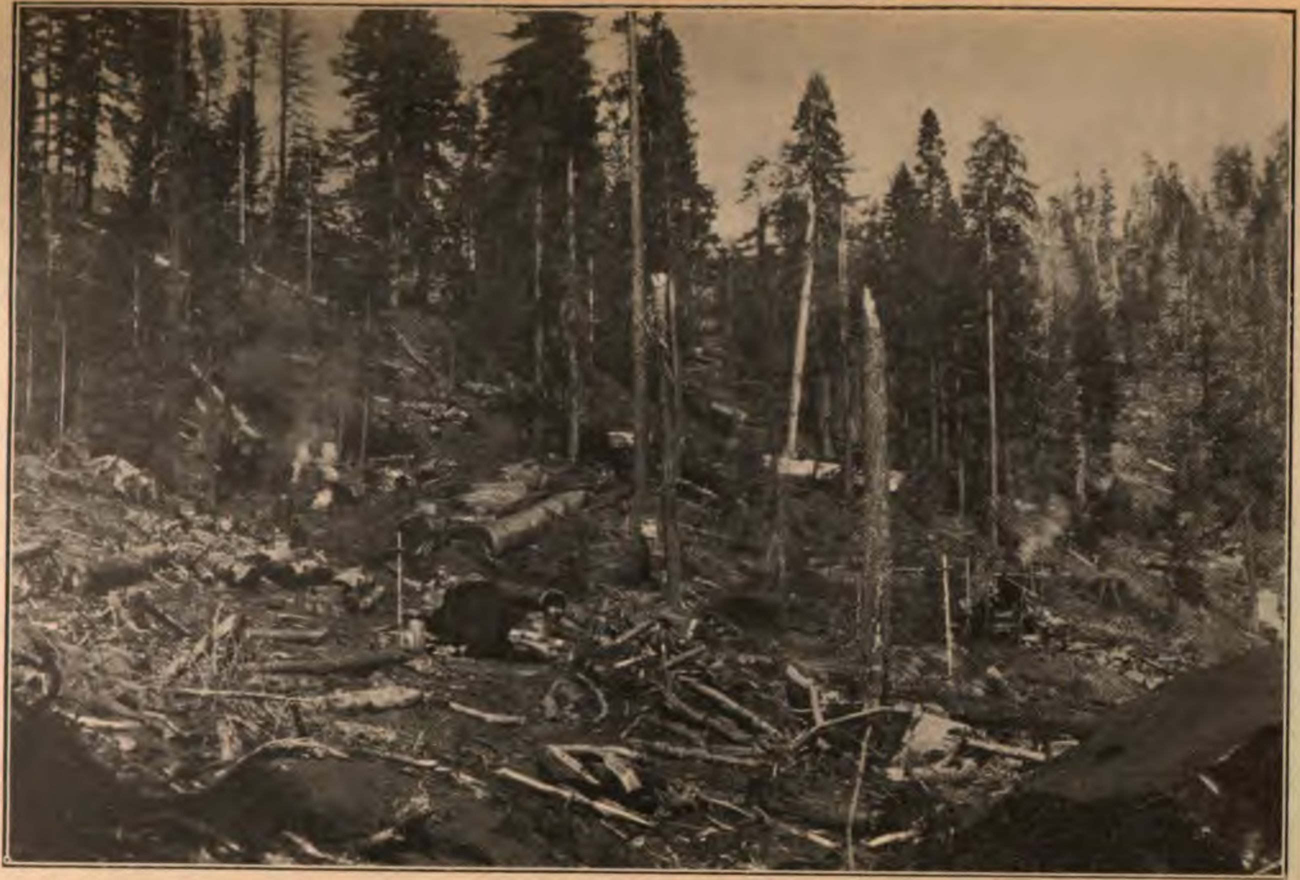
TECHNICAL FORESTRY.

Two years ago I was not able to show that much had been accomplished in the line of technical forestry, but in December, 1907, as a result of the coöperative work in forestry between the Forest Service of the Department of Agriculture and the State of California, the State Board of Forestry issued Circular No. 2, "A Handbook for Eucalyptus Planters." This circular called attention to the yield from eucalyptus grown in California. It emphasized the fact that eucalyptus grows fully five times as fast as any other hardwood tree, and gave full instructions as to the methods of propagating these trees.

As a result twenty-three companies have been incorporated in the State since that time, for the purpose of dealing in eucalyptus lands and the products from eucalyptus plantations. In addition, fifteen companies engaged in the sale of real estate have turned their attention to eucalyptus, so that at the present time thirty-eight companies in California are devoting all or the greater part of their energy to the propagation of this genus. A great number of landowners have commenced the propagation of eucalyptus on their own account. From present indications it seems safe to predict that the growing of eucalyptus for revenue has become a fixed industry in the State. The majority of the companies are operating on a large scale, many of them owning from 1,000 to 5,000, or even 10,000, acres of land.

The general plan is to secure the land and plant the seedlings when they are from six to eight inches in height, cultivate and irrigate them until they are two years old, after which time, if the land and species have been properly selected, there is no need of further attention being given, except to see that they are protected from fire. The prospect of securing very large returns with a minimum of care seems to appeal very strongly to investors in this and other states, as well as in other countries. This industry has attracted many people to California, and is proving an alluring investment for many who reside in other states. It seems possible to predict that on the maturity of the plantations now being started there will be attracted to California the large vehicle and furniture manufacturing plants that have contributed so largely to the prosperity of the hardwood states of the East.

The fact that eucalyptus will not withstand severe frosts confines its propagation to the temperate portions of California, and thus gives to this State a practical monopoly upon the hardwood supplies of the future. It does not seem possible to estimate what this industry may mean to this State. Certainly it will result in the immediate conversion of large areas of land that are now producing low returns into properties yielding a very high revenue. It may mean eventually that the eucalyptus industry will be even a more fruitful source of revenue to the State of California than the orange industry has been.



TYPICAL SCENE AFTER LUMBERING. SCATTERED DEBRIS CONSTITUTE A GREAT FIRE MENACE. FRESNO COUNTY.

Section 4 of the State Forest Law provides that the State Forester shall, upon request, make an examination of land to determine its adaptability to tree growth, and shall prepare plans for the planting of tracts. Under this section we have examined 39,860 acres of land since May, 1907. On account of our small office force it has been impossible to make as careful examinations as the circumstances warranted. Moreover, it has been impossible to find time to prepare detailed plans for planting. The best we have been able to do was to make hurried field examinations and report the results by letter. This has been unsatisfactory, for the reason that in many cases these lands have been sold to parties who have never seen them and who have depended on the report of this office in their purchases. If we accept the responsibility which devolves upon us in the starting of this industry we should have more men, so that we could take time to become thoroughly familiar with the conditions on each tract, and thus reduce the probability of any mistake.

Furthermore, we have not been able to meet all the demands made upon us for land examinations. At the present time there are three examinations pending which have been on file for several months; several for shorter periods. One of these is aimed to improve the slopes of Mount Hamilton and thus better the conditions for making observations. It appears from the letter of the Director of the Lick Observatory, who requested an examination on June 30, 1908, that the uncovered soil and rocks become too highly heated by the sun's radiations and, remaining heated for a considerable time after dark, cause currents of heated air to ascend. In the early evening the observing conditions are made poorer on account of the fact that it is necessary for the observers to look through these disturbed currents. For these reasons it seems desirable to establish some sort of forest cover on the barren slopes to prevent the rocks from becoming heated. Such work is so obviously important that means should be at hand to give it immediate attention.

Recommendations.

To meet the rapidly increasing demands on the office for land examinations, and for work of more general nature, I strongly recommend that the force of the office be increased by at least one technically-trained forester.

EXPENDITURES.

As I have already explained, the work of this office on its establishment was of a pioneer character and the people of the State being unfamiliar with the ends it sought to accomplish were slow in making use of its services. My predecessor in office was confronted with many difficulties in the way of organization. The Forest Law fixes the salary of Assistant State Foresters at $1,200 per annum, and at this figure it was impossible to secure men of forestry training and exceedingly difficult to find those without it who possessed the originality and ability to interest the people in a new business. Without these accomplishments the money would have been poorly spent. On that account the greater part of the year which he held office passed without the employment of any assistants. In the latter part of that year he was able to secure one of approved qualifications, but the place of the other was not filled during his term of office.

For these reasons the greater part of the appropriation for the first two years remained unexpended at the time I became State Forester, and during the fiscal year following the amount of work required of the office was not great enough, under the careful plans followed, to demand the expenditure of the relatively large balance remaining. Hence, at the end of the two fiscal years for which the first appropriation was made an unexpended balance remained.

In my last report I furnished a detailed statement of the expenditures from the establishment of the office until October 31, 1907, at which time a balance of $10,102.90 remained. The expenditures during the balance of that fiscal year were as follows:

EXPENDITURES OF STATE FORESTER'S OFFICE.

November 1, 1906, to June 30, 1907.

Balance November 1, 1906		$10,102 90
Salaries	$3,160 00	
Traveling expenses	969 89	
Stenography and typewriting	775 00	
Printing and binding	1,314 85	
Postage	355 85	
Office rent	160 00	
Incidentals	1,192 73	
		7,928 32
Unexpended balance at end of the fifty-eighth fiscal year		$2,174 58

The unexpended balance was returned to the General Fund in the State treasury.

It will be noticed that the expenditures of the last part of the fifty-eighth fiscal year greatly exceeded its proportionate amount of the appropriation of $17,600 made by the legislature for the fifty-seventh and fifty-eighth fiscal years. This in itself indicated that the expenditures of the fifty-ninth and sixtieth fiscal years would exceed the appropriation made for the two fiscal years preceding. We were fortunate enough to secure for the fifty-ninth and sixtieth fiscal years an appropriation of $22,100, representing an increase of $4,500. It was divided as follows:

For salary of State Forester	$4.800 00
For salaries of two Assistant Foresters	4.800 00
For support of the State Board of Forestry, including field and traveling expenses	10.000 00
For printing, binding, and ruling, and all work and materials furnished by the State Printing Office	2.500 00
	$22,100 00

The expenditures under this appropriation follow:

Appropriation for salary of State Forester		$4.800 00
Salary, State Forester		3.200 00
Balance		$600 00
Appropriation for salaries of Assistant Foresters		$4.800 00
Salaries, Assistant State Foresters		3.200 00
Balance		$600 00
Appropriation for support of the State Board of Forestry		$10,000 00
Traveling expenses	$2,611 39	
Stenography and typewriting	1,618 07	
Postage	857 00	
Expressage	169 57	
Incidentals	3,090 46	
		8.346 49
Balance November 1, 1908		$1,653 51

Our support fund became exhausted in June of the fifty-ninth fiscal year, and it became necessary to draw $164.93 from the Forestry Fund, accumulated by fines paid for violations of the forest laws, in order to tide us over until the support appropriation for the sixtieth fiscal year became available. A more serious condition confronts us at the present time. From the statement above it will be noticed that our support fund on November 1, 1908, contained only $1,653.51. This will permit of an average monthly expenditure during the balance of the fiscal year of only $206.70. Out of this amount $100 per month must be paid for the services of the stenographer and janitor. The balance is so small that it will barely cover the most necessary expenses of the office, such as postage, expressage, etc., leaving practically no money available for traveling purposes.

Recommendations.

I called attention above to the fact that at the end of the fifty-seventh fiscal year an unexpended balance of $2,174.58 was turned back into the General Fund. I strongly recommend that the coming legislature be requested to return this sum to the credit of the support fund of the State Board of Forestry, to be used during the balance of this fiscal year.

I wish to direct special attention to the low salaries paid the employees of the State Board of Forestry. It is impossible to find elsewhere, even in State employ, men of equal ability who are not paid fully twice as much. It has been related that great difficulty was experienced in the beginning to find men qualified to fill the positions of Assistant State Foresters at the salary fixed by statute. The present incumbents are both men of forestry training and of considerable experience in this and other states. It may not be expected that they will be willing much longer to remain in the employ of the State at salaries less than are paid ordinary clerks in other departments. The experience they have gained of conditions in California makes their services more valuable to the State than when they came or than those of men who could be secured outside. For these reasons, I strongly recommend that the salaries of Assistant State Foresters be increased to $2,400 per year.

The State Forester is paid $2,400 per year and is thus placed on a plane with the deputies in other State offices. At the present time there is a strong demand from the newly formed eucalyptus companies for foresters' service. Their offers are from two to three times what the State Forester is now receiving. It would appear that the State should maintain in the position of State Forester a man who, by his training and experience, is able not only to meet the general forestry problems of the State, but who should be qualified to gather information for the encouragement of the eucalyptus industry. Furthermore, as more companies are formed, it will become increasingly necessary for him to pass upon the claims as to the returns of the different companies in order to safeguard the interests of the investing public. It is the State's duty, in my opinion, to furnish this information, and it can be done capably only if the State stands ready to employ as good or better men than the eucalyptus companies themselves. No satisfaction or advantage will accrue to the State from making changes in the head of the Forestry Department, yet this result will naturally follow unless the salary of the State Forester is put at such a figure that he will not be tempted away by alluring offers from private parties.

The success of the constitutional amendment increasing the salaries of certain elective State officers would seem to indicate that the people generally are favorably inclined in this direction. I doubt if at the present time there is sufficient appreciation of the importance of the Forestry Department, but I am equally impressed with the belief that this lack of appreciation is due to lack of understanding of its work. No one who is thoroughly familiar with the extent of the demands being made upon it at the present time can fail to urge, for the State's interest alone, that the Forestry Department be strengthened. For these reasons alone I strongly recommend that the salary of the State Forester be placed at $4,800.

Elsewhere in this report I recommended a special appropriation to be used only in coöperating with counties for fire protection. This would have no bearing upon our support fund for the sixty-first and sixty-second fiscal years. I have shown that with the strictest economy we have practiced in the fifty-ninth and sixtieth fiscal years we are confronted with the necessity of requesting an immediate appropriation. The economic use of this appropriation may be exemplified by the statement that the stenographer in this office, who really occupies a clerk's position, is paid only $85 a month, although her work is coördinate with that performed by similar employees in other departments who are paid from $1,600 to $1,800 per year. It should be immediately apparent that there is need, from the standpoint of fair play alone, to remedy this condition. If the business of the Forestry Department proceeds during the coming two years at no more than its past rate of growth the work will demand an expenditure of at least $30,000. I strongly recommend that the support fund for the sixty-first and sixty-second fiscal years be not less than this amount.

I am glad to be able to report that the prospects are that our Printing Fund will be sufficient to carry us through the present fiscal year. I would recommend that the Printing Fund for the sixty-first and sixty-second fiscal years be placed at $3,500 instead of $2,500 in order to admit of the printing of such additional publications as will naturally follow from the growth in other directions.

CALIFORNIA REDWOOD PARK.

In July, 1907, the State Board of Forestry issued a circular descriptive of California Redwood Park, in order to call the attention of the people of this great pleasure ground which the State is maintaining for their use. It seems to have had the result of increasing the number of visitors to the Park greatly. For example, in 1907, 2,230 visitors registered at the Park and probably 10 per cent of those who visited it failed to register. During the past season 2,757 registered, with probably about the same percentage in addition. California Redwood Park is fast becoming a popular summer resort for those who desire rest and quiet with unexcelled forest scenery.

To facilitate the handling of the increasing number of visitors the Board of Forestry erected a substantial two-story cottage made of redwood logs of uniform size and surrounded on three sides by a broad veranda. The cottage is used in summer as a dining-room for visitors to the Park. It is fitted with a fireplace, which adds to its comfort in the evening and during cool days in the spring and fall.

Prior to the time California Redwood Park was transferred to the care of the State Board of Forestry there were several cottages of unfinished redwood boards built near the present site of the cottage, at what is known as "Governor's Camp," and these are now used so far as possible for the sleeping accommodations of the guests. It is always necessary in summer to use several tents to accommodate those whom the cottages will not hold. The tents are provided with board floors, washstands, and bedding furniture, and prove fully as desirable during the summer season as the cottages. With the present facilities we can accommodate overnight about thirty people, but during the past season there have been, at times, double this number who desired accommodations, and they had to be turned away owing to the lack of tents.

The Park cost the State in the beginning $250,000, and more than $50,000 has since been spent in maintaining it. It would seem to be only good business economy to equip a property of this value with accommodations for all who care to visit it.

The general administrative work at the Park has proceeded uneventfully during the past two years. It has consisted, first of all, in completing a system of fire lines around the Park. These fire lines are from 40 to 60 or more feet in width, and from them all inflammable material has been removed. In most cases the roots of the trees were grubbed out at the time the fire line was constructed. In a few instances, however, on account of our haste to encircle the Park, the roots were not removed when the first clearing was made. It has been necessary, during the past two seasons, to go over these portions and grub out the stumps in order to prevent them from coppicing. This work has required the services of from two to three men during the summer season. Their presence would have been necessary, or at least desirable in any case, consequently the work of clearing the fire lines may be looked upon as giving them employment while they were really stationed on the rim of the basin in which the Park is located to see that fires did not come in from the outlying country. I consider that it will be desirable for a long time to keep two or more men stationed at different points on the edge of the basin to give notice of neighboring fires. This will give time to summon men to the fire line where back-firing may be commenced to prevent any fire from entering the Park. I am able to report that there has been no fire in the Park since it has been under the care of the State Board of Forestry.

In addition to work on the fire trails a small number of men were engaged, in the early part of the season, to clear the roads and trails of fallen trees and limbs. This will be necessary from season to season.

During the early part of last year a private telephone line was constructed from Boulder Creek to the Park. This affords a very much needed convenience, and would be of great service in summoning men in case a fire should break out.

The Park is reached by train from San Francisco to Boulder Creek. and thence by stage over a scenic mountain road 12 miles in length. The stage is run about four or five months each year, and makes daily trips. It carries the mail from Boulder Creek to California Redwood Park, the new post office secured for the Park through the efforts of Congressman Needham.

Until two years ago the road became very dusty in summer and the trip was rather unpleasant. This has been remedied recently by sprinkling, the county of Santa Cruz sprinkling from Boulder Creek to the Park boundary and the Board of Forestry conducting the sprinkling from there to Governor's Camp. This has not only placed the road in good order, but removed the dust. During the past summer some of the supply tanks along the road became dry on account of the unusual drought, and sections of the road were unsprinkled for a considerable period. This temporarily caused annoyance from dust. It is probable, however, that the present facilities for sprinkling the road will be adequate during ordinary seasons.

The lodging and boarding accommodations at the Park were conducted during the summer of 1907 by Mrs. Rambo, the wife of Senator S. H. Rambo, the present warden. On his request the Board of Forestry sought another party to conduct this business last summer in order to relieve Mrs. Rambo. We were fortunate in securing the services of Mrs. Abbie A. Elsom of Stockton, who has proved an efficient hostess.

In my last report I stated that a cottage would be built at the Park entrance on the 5-acre tract donated to the State by Mr. H. L. Middleton of Boulder Creek. This was considered necessary for the headquarters of the foreman. In winter the dampness under the large redwood trees at Governor's Camp is so great that it is impossible for any one to live there, yet it is desirable to have some one at the Park who can have general oversight. In the summer it is desirable to have the foreman located somewhere on the higher land so that he can keep a general lookout over the surrounding country for forest fires. His location at the entrance to the Park is of value also to those who go there because they can obtain from him general information regarding the Park. Accordingly, the cottage was constructed at the Park entrance.

In September, 1904, a disastrous fire occurred in the Park near Sempervirens Camp. It killed most of the fir, oak, and madrone trees in its path, and many redwood trees which, on account of previous fires, were of low vitality. These dead trees remained standing in the Park and were a menace to it and to those who visited it, because they afforded dry fuel for any chance fire, and were decayed to the point where they were commencing to shed their limbs. In order to remove this menace I recommended to the State Board of Forestry that a contract for cutting them be entered into. It would have been more desirable, for many reasons, for the Board of Forestry to have handled their removal, but this was impossible on account of the low condition of our appropriation. Following the consent of the State Board of Forestry I entered into a contract with Wm. M. Elson, of Santa Cruz, for the removal of the fire-killed trees. This work was commenced in the early part of last winter and proceeded until August 31st of this year, when the contract expired. During this period a large number of trees were cut and their contents removed. The work has been conducted in a very satisfactory manner, and the results have been beneficial in many ways. Following the removal of the trees the workmen at the Park piled and burned the limbs and other débris, which left the ground in very good condition for reproduction. It is safe to say that the fire scars in this area will soon be hidden by a strong growth of young redwoods and firs.

There remains, particularly near the entrance to the Park, a considerable area of fire-killed firs which are fast losing their value for any purpose, and which will ultimately decay and fall. Under instructions from the State Board of Forestry in September, 1908, I advertised for a contract for the removal of these trees. Only one bid was received, and this called for a change in the terms of the contract. On account of the stress of other work the contract has not yet been awarded. This work will receive early attention.

EXPENSES OF CALIFORNIA REDWOOD PARK.

November 1, 1906, to October 31, 1908.

Balance November 1, 1906		$8.675 88
Expenditures November 1, 1906, to June 30, 1907:		
Warden's salary	$1.000 00	
Foreman's salary (April to June, inclusive)	300 00	
Construction of telephone line	596 00	
Labor and supplies	6.509 24	
Printing	270 50	
		8.675 74
Unexpended balance end of fifty-eighth fiscal year		$0 14
Appropriation, fifty-ninth and sixtieth fiscal years		$10.000 00
Warden's salary (16 months)	$2,000 00	
Foreman's salary (16 months)	1,600 00	
Labor and supplies	2.923 05	
		6.523 05
Balance November 1, 1908		$3.476 95
Appropriation for printing fiftieth and sixtieth fiscal years		$100 00
Balance November 1, 1908		$100 00

Recommendations.

At its session in 1906 the legislature reduced the appropriation for the support and maintenance of California Redwood Park from $10.000 to $5,000 per year, and created a printing fund of $50 per year; there seems to have been no reason for either of these changes. The result has been that we have not been able to conduct any improvement work at the Park, that considerable necessary work has been left undone, and the work of removing from the Park the fire-killed timber which otherwise could have been done by the State has had to be done by contract.

From the time of the purchase of California Redwood Park until it came into the hands of the State Board of Forestry very little work in the way of making it accessible to visitors was done, consequently this work has devolved upon the State Board of Forestry. During the first two years the Board had control of the Park it had an appropriation of $10,000 a year to work on and a great deal of necessary improvement work was accomplished. When this work was at its height the legislature, without reason, cut the appropriation exactly in half. This forced retrenchments in every direction and prevented the continuance of the work. It would seem that if the State intends to maintain this property for the benefit of the people that it would be only good policy to maintain it properly. This can not be done for $5,000 per year; consequently, I recommend that the appropriation of California Redwood Park be restored to $10,000 per year, and that the printing fund, for which there has been no use, be cut off. The small amount of supplies required from the State Printing Office may very well be purchased from the general appropriation.

WATER SUPPLY AND SEWAGE DISPOSAL.

During the past season, which was unusually dry, the water supply of the Park gave out, and it became necessary to carry water from the stream for camp use. This entailed a great amount of work and considerable inconvenience, and caused much dissatisfaction, because the water near the camp is of uncertain purity.

It seems desirable to furnish the camp with an abundant supply of pure water. On that account I asked the State Engineer to make a survey to show the best available source of water and the approximate cost of installing a water system. The report of Mr. P. N. Narboe, Assistant State Engineer, who was detailed on this work, follows:

"October 17, 1908.

Mr. N. Ellery, *State Engineer, Sacramento, California.*

Dear Sir: In compliance with your verbal instructions, made at the request of Mr. G. B. Lull, State Forester, I visited the California Redwood Park near Santa Cruz, and investigated the feasibility of installing water supply and sewage disposal systems for the main camp.

That portion of the Park which attracts most visitors is a small valley in the middle of the "Big Basin," at the junction of the East Fork of Waddell Creek with Bloom's Creek. The floor of the valley is slightly rolling, covered with a heavy growth of virgin forest and dense undergrowth. The administration headquarters and main camping ground, known as Governor's Camp, is situated in the north arm of the valley, along Waddell Creek, and at the terminus of the road from Boulder Creek. From this point trails radiate in several directions to different points of interest, but no wagon roads as yet have been constructed.

About ten (10) acres of the valley have been partly cleared of underbrush, and it is here that the administration buildings, boarding and lodging houses and camps are established.

The number of inhabitants, campers, and visitors have seldom exceeded two hundred (200) in one day, but as the Park becomes better known and its beauties appreciated, the number of visitors and of campers will be greatly increased, so that facilities should be provided for about one thousand (1,000) people.

The only water supply now available is Waddell Creek, flowing along one side of the camp ground. The only means of disposing of sewage and refuse is by depositing on the surface of the ground or in pits. In either case it finally reaches the creek, and in a short time will become a menace to the health of all using the water of the creek.

Water Supply.—Water can be brought to the grounds in pipes under pressure, sufficient for several thousand people, either from Bloom's Creek, Union Mill Creek, Sempervirens Creek, or Maddock Creek, or all combined, if need be. All but the last named, however, have their watersheds on private lands used for grazing, sawmills, shake and post makers, camps, etc., so that the water is subject to more or less pollution.

The last named, Maddock Creek, has its source removed from accessible timber to tempt the lumbermen, and with but little grazing land. At a distance of less than six thousand (6,000) feet from the camp, the creek is at an elevation of 104 feet above the bed of Waddell Creek at Governor's Camp. Water may be piped from here and delivered into tanks on the hillsides above the camp at sufficient elevation to give ample pressure for fire protection to the buildings.

At the time of my visit, October 9th, I measured the water flowing in Maddock Creek, and found it to be eighteen (18) gallons per minute, equivalent to 25,920 gallons in twenty-four (24) hours, and the creek was lower than has been known in twenty-five (25) years, so that it seems to be safe to estimate this source as sure to provide enough water at all times for over a thousand people at the camp. Should the population be enough greater to require all the supply for domestic use, then by an expenditure of say $150 a hydraulic ram can be installed in Waddell Creek at the camp which will supply the grounds for sprinkling and watering stock.

Sewage Disposal.—As above stated, the method of disposing of sewage matter now in practice is to deposit in pits or on the surface of the ground. Much excreta is deposited on the ground in secluded spots for the reason that there are no public toilets. Camp slops and refuse are thrown on the ground. As the population increases, these practices will become unbearable nuisances as well as menaces to health, even when the source of water supply is removed beyond chance for contamination.

To provide a means of proper disposal of the camp sewage there should be a number of automatic flushing range toilets and urinals placed at convenient and inconspicuous points about the grounds. These to discharge through sewer pipes into a trunk sewer traversing the grounds along near the creek bank, and terminating in a septic tank situated far enough so that any slight odor arising therefrom shall not reach the camp. The effluent from the tank, after undergoing the cleansing septic action, may be discharged into the creek without harm.

I submit a plat of the portion of the Park embracing Governor's Camp and vicinity, also a sketch showing a tentative plan for water supply and sewage disposal plants, to cost about $5,000.

I desire to acknowledge my indebtedness to Senator S. H. Rambo, warden, and Mr. J. H. Creed, foreman, for many courtesies and much assistance in my investigations.

Respectfully,

(Signed) P. N. NARBOE."

Up to the present time the sewage of the camp has been deposited in holes dug in the earth without any means of escape except through seepage to the stream. This system was tolerable so long as there were only a few visitors to the camp, but with the increasing number of visitors the problem of sewage disposal has become of vital importance. Unless something is done to remedy existing conditions it seems only a question of time until the camp will become disease-infected. The report of the Assistant State Engineer includes a plan for the disposal of sewage. I urge that funds be appropriated to meet the expenses necessary for the installation of both a water and a sewage system.

PROPOSED STATE REGULATION OF TIMBER CUTTING ON PRIVATE LANDS LOCATED ON THE WATERSHEDS OF IRRIGABLE STREAMS.

In September, 1907, the Fifteenth National Irrigation Congress, at its session in Sacramento, passed the following resolution:

> "*Resolved*, That the Fifteenth National Irrigation Congress urges upon the people of California the need of enacting a law giving the State Board of Forestry power to examine all private forest holdings on the watersheds of irrigable streams, and to designate and enforce such rules for cutting as in its judgment will secure the continuity of said forests and pervent injury to said streams."

The opinion of the more thoughtful men in California and in the United States is favorable to the enactment of a law conferring upon the State Board of Forestry the power implied by this resolution. It is unquestioned that the State will face the necessity of taking action in this direction ultimately and it would appear that it is better to commence before the watersheds of the State have suffered irreparable damage by careless lumbering operations. The need for this arises from the fact that under the present methods of logging in our pine forests, where the trees are approximately even-aged, practically all the merchantable species are removed leaving as parent trees for the second crop inferior species worthless for market purposes. Moreover, the logging operations in many cases are conducted in such a careless manner as regards débris that after the removal of the timber the area is easily susceptible of visitation by forest fires. If fires follow, as they

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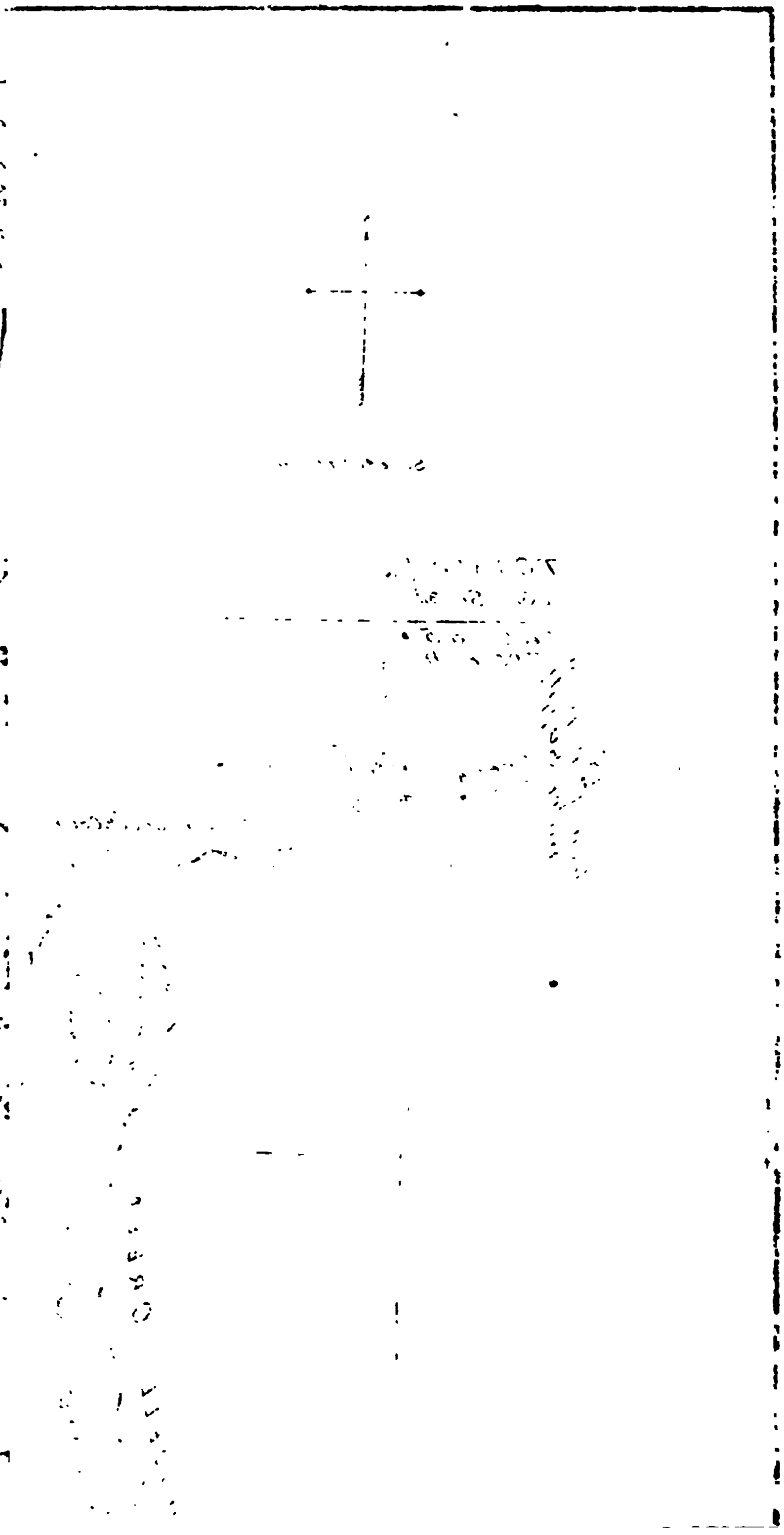

usually do, the few trees of inferior kinds that are left are killed and the site is soon occupied by chaparral to the exclusion of forest species. This has happened so frequently that chaparral has come to be regarded as the successor of the forest.

Statistics show that between the years 1899 and 1904 the lumber cut of California increased 83.7 per cent. This is a greater increase than that of any other state except Washington and Oregon, where the percentages were 212.5 per cent and 118 per cent respectively. These percentages show in an alarming way the Western movement of the lumber industry for virgin supplies. There can be no doubt that the forest area of California, upon which the irrigation of the valleys and the control of the streams depends so vitally, will not be able to withstand the onslaughts of many years at the increasing rate of cutting.

If the contention that some action will be required of the State ultimately to protect her forest resources be true, it would appear much better to take the step now before any greater injury results. It would not appear that the regulation of cutting would cause serious hardship to the owners of timber lands. In a general way it would mean that the State would demand that when an area was lumbered that sufficient trees of the more valuable species be left to re-seed the area; that the limbs, tops and unused portions of the trunks of the trees be piled and burned or removed so that the second crop would not be menaced by their presence. The difference between present methods and those which a law of this kind would require are not great enough to diminish markedly the lumber cut on an area, nor would the expense entailed by destroying the débris be sufficient to make a serious inroad on the profits. But it would mean much for the future of the area lumbered in that the prospects would favor the reproduction of a valuable forest thereon.

It may be argued that when the timber supplies of California are exhausted that substitutes for wood can be found or that wood supplies may be imported from other sections. Granting, for the sake of argument, that these things might be done, there still remains the great unanswerable argument that the water conditions of California require that the mountains be covered with forest growth. Water for domestic and irrigation use must be obtained at home. Whether or not this is looked at from the standpoint of the agriculturist or from the power-producing standpoint, certain it is that the future of California depends most vitally upon the condition of the forest on her mountain slopes.

That the transporting power of our rivers and the power-producing value of our streams, as well as the steady flow of water for irrigation and domestic use is being damaged by the removal of forest from the mountain slopes, is generally admitted. These interests exceed in present importance the value of the timber removed and their future value may not be estimated. It would seem that wise foresight would require that conditions for the steady development of these interests be preserved, especially when the ends may be accomplished at only small cost to the lumber industry. It would seem good policy on the part of the State to remunerate the timber owners for the amount of timber required for seeding purposes rather than to allow the watersheds to be permanently deforested.

When this question first arose many considered that the Constitution would prevent the State from taking action in regulating the operations of the lumbermen. The decision of the Supreme Court of the State of Maine seems to have disposed of this obstacle. This decision holds that it is within legislative power to restrict the cutting of trees in wild lands in the interest of forestry, the preservation of water power and rainfall and general utilities of public interest. It contends that the proposed legislation would be within legislative power and would not operate as a taking of private property for which compensation must be made.

The question was propounded to the Supreme Court as follows:

In order to promote the common welfare of the people of Maine by preventing or diminishing injurious droughts and freshets and by protecting, preserving, and maintaining the natural water supply of the springs, streams, ponds, lakes, and of the lands, and by preventing or diminishing injurious erosion of the land and the filling up of the rivers, ponds and lakes, and as an efficient means necessary to this end has the legislature power under the constitution—

1. By public general law to regulate or restrict the cutting or destruction of small trees growing on wild or uncultivated land by the owner thereof without compensation therefor to such owner;

2. To prohibit, restrict, or regulate the wanton, wasteful or unnecessary cutting or destruction of small trees growing on any wild or uncultivated land by the owner thereof, without compensation therefor to such owner, in case such small trees are of equal or greater value standing and remaining for their future growth than for immediate use, and such trees are not intended or sought to be cut for the purpose of clearing and improving such land for use or occupation in agriculture, mining, quarrying, manufacturing or business or for pleasure purposes or for a building site; or

3. In such manner to regulate or restrict the cutting or destruction of trees growing on wild or uncultivated lands by the owners thereof as to preserve or enhance the value of such lands and trees thereon and protect and promote the interests of such owners and the common welfare of the people;

4. Is such regulation of the control, management or use of private property a taking thereof for public uses for which compensation must be made?

The opinion of the court is as follows:

"*To the President of the Senate*: The undersigned justices, in obedience to the requirement of the constitution, severally give the following as their advisory opinion upon the questions submitted to the justices of the supreme judicial court by the Senate order of March 27, 1907:

We find that the legislature has by the constitution 'full power to make and establish all reasonable laws and regulations for the defense and benefit of the people of this State, not repugnant to this constitution nor that of the United States;' Constitution of Maine, Article IV, Part III, Section 1. It is for the legislature to determine from time to time the occasion and what laws and regulations are necessary or expedient for the defense and benefit of the people; and however inconvenienced, restricted or even damaged particular persons and corporations may be, such general laws and regulations are to be held valid unless there can be pointed out some provision in the state or United States Constitution which clearly prohibits them. Those we understand to be universally accepted principles of constitutional law.

As to the proposed laws and regulations named in the Senate order, the only provision of the United States Constitution having any possible application to such legislation by a State would seem to be that in Fourteenth Amendment. As to that provision, we think it sufficient to quote the language of the United States Supreme Court in *Barbier* vs. *Connolly*, 113 U. S. 27, where, speaking of the Fourteenth Amendment, the court said: 'But neither the amendment, broad and comprehensive as it is, nor any other amendment was designed to interfere with the power of a State, sometimes termed its 'police power,' to prescribe regulations to promote the health, peace, morals, education, and good order of its people, and to legislate so as to increase the industries of the State, develop its resources and add to its wealth and prosperity.' It may be added that the proposed laws and regulations would not discriminate between persons or corporations but only between things and situations, with a classification not merely arbitrary but based on real differences in the nature, situation, and condition of things.

We think the only provisions in the State constitution that could be reasonably invoked against the proposed laws and regulations are the guaranteed right of 'acquiring, possessing, and defending property' and the provision that 'private property shall not be taken for public use without just compensation.' If, however, the proposed legislation would not conflict with the latter provision, it evidently would not with the former, hence only the latter one need be considered.

The question of what constitutes a 'taking' of private property in the constitutional sense of the term has been much considered and variously decided. In the earlier cases and in the older states the provision has been construed strictly. In some states, in later cases, it has been construed more widely to include legislation formerly not considered within the provision. Still more recently, however, the tendency seems to go back to the principles enunciated in the earlier cases. In Massachusetts, one of the earliest states to adopt the constitutional provision, and in Maine, adopting the same provision in succession, the courts have uniformly considered that it was to be construed strictly as against the police power of the legislature."

There follows citations from various cases to uphold the opinion above rendered. Continuing the opinion says:

"We think it a settled principle, growing out of the nature of well ordered civil society, that every holder of property, however absolute and unqualified may be his title, holds it under the implied liability that his use of it shall be so regulated that it shall not be injurious to the equal enjoyment of others having an equal right to the enjoyment of their property, nor injurious to the rights of the community. All property in this commonwealth, as well as that in the interior as that bordering on tide waters, is derived directly or indirectly from the government and held subject to those general regulations which are necessary for the common good and general welfare. Rights of property, like all other social and conventional rights, are subject to such reasonable limitations in their enjoyment as shall prevent them from being injurious, and to such reasonable restraints and regulations established by law as the legislature, under the governing and controlling power vested in them by the Constitution, may think necessary and expedient. This is very different from right of eminent domain, etc.

In the case *Wadleigh* vs. *Gilman*, 12 Maine, 403, decided in 1835, only fifteen years after the adoption of our constitution, there was upon the plaintiff's land a wooden building. A city ordinance was passed by legislative authority prohibiting the erection of wooden buildings within certain limits, which included the plaintiff's building. After the passage of the ordinance the plaintiff moved his building to another place within the same inhabited limits. The defendant, as city marshal, acting under the ordinance, entered upon the plaintiff's land, took the building down. The court held the ordinance valid and the defendant protested and declared as follows: 'Police regulations may forbid such a use and such modifications of private property as would prove injurious. This is one of the benefits which men derive from associating in communities. It may sometimes occasion inconvenience to an individual, but he has compensation in participating in the general advantage. Laws of this character are unquestionably within the scope of the legislative power without impairing any constitutional provision. It does not appropriate private property to public use but merely regulates its enjoyment.' "

Other citations follow and the opinion continues:

"There are two reasons of great weight for applying this strict construction of the constitutional provision to property in land: First, such property is not the result of productive labor, but is derived solely from the State itself, the original owner; second, the amount of land being incapable of increase, if the owners of large tracts can waste them at will without state restriction, the state and its people may be helplessly impoverished and one great purpose of government defeated.

Regarding the question submitted, in the light of the doctrine above stated (being that of Maine and Massachusetts at least) we do not think the proposed legislation would operate to 'take' private property within the inhibition of the constitution. While it might restrict the owner of wild and uncultivated lands in his use of them, might delay his taking some of the product, might delay his anticipated profits, and even thereby might cause him some loss of profit, it would nevertheless leave him his lands, their product and increase untouched and without diminution of title, estate or quantity. He would still have large measure of control and large opportunity to realize values. He might suffer delay but not deprivation. While the use might be restricted it would not be appropriated or 'taken.'

The foregoing considerations lead us to the opinion at present that the proposed legislation for the purposes and with the limitations named in the senate order would be within the legislative power and would not operate as a taking of private property for which compensation must be made.

Respectfully submitted.

(Signed) LUCIUS A. EMERY.
WILLIAM P. WHITEHOUSE.
S. C. STROUT.
HENRY C. PEABODY.
ALBERT M. SPEAR.
LESLIE C. CORNISH."

March 10, 1907.

Whether action in the direction above outlined would conflict with the constitution of the State of California may be left for legal minds to decide. If not, it would seem advisable for the legislature to take this matter in hand at an early date in order to protect the great industries threatened by deforestation. Realizing the importance of placing in the hands of the legislature data which will help it to a decision as to whether or not this legislation is imperative, with the consent of the State Board of Forestry I have conducted an examination of the private timber holdings located on the watersheds of irrigable streams in this State. This examination is practically finished and its findings will be incorporated in a separate report which may be expected at an early date.

PROPOSED DONATION OF LAND TO THE STATE.

Mrs. Annie E. K. Bidwell, owner of Rancho Chico, Chico, California, desires to donate to the State of California certain streams and land contiguous thereto which form part of her rancho. Her object is to preserve in their natural condition these streams and their bordering vegetation for their beauty and for the welfare of the people owning adjacent property. She fears that after her death the value of adjacent property will be impaired if the water from these streams were diverted and if the fine growth of trees along them were destroyed. For these reasons she wishes to donate this property to the State in order that it may be preserved in its present condition. In this connection the letter of Colonel C. C. Royce, the manager of Rancho Chico, sheds considerable light. His letter is as follows:

CHICO, CALIFORNIA, March 3, 1908.

The State Forester, Sacramento, Cal.

DEAR SIR: Referring to your recent interview with Mrs. Bidwell on the subject of placing certain lands on Rancho Chico under the ownership of the State Board of Forestry, I have to say that her proposal covers the following conditions:

First. She proposed to convey to the State Board of Forestry the following described lands, viz: All that strip of land of varying width bounded on the west by the Sacramento River and an inlet thereof; on the east by the west line of Sutter avenue and the west line of the county road, said strip of land extending from the north boundary of Rancho Arroyo Chico in the northwest quarter of section 22, township 22 north, range 1 west, M. D. M., to the southerly extremity of said Rancho Arroyo Chico on the north bank of Chico Creek near its confluence with the Sacramento River in section 2, township 21 north, range 1 west, M. D. M., excepting and reserving therefrom Lot 32 of the meridian subdivision of the John Bidwell Rancho.

Second. A strip of land of varying width, including both banks and the channel of Lindo Channel, otherwise called Sandy Gulch, from the point where said Lindo Channel intersects the line of the park deeded by Annie E. K. Bidwell to the city of Chico, July 10, 1905, to the point where said Lindo Channel disembogues into Chico Creek. Said strip herein proposed to be conveyed includes all lands lying between the 7th, 6th and 3d subdivisions of the John Bidwell Rancho, the Cussick Tract, the lands of H. B. Reed and Park Henshaw, the 12th and 15th subdivisions of the John Bidwell Rancho and the said park line, all on the northwest side of said Lindo Channel, and the 7th, 2d, 4th, and 14th subdivisions of the John Bidwell Rancho and a strip between the said 14th subdivision and the said park line, all on the south and east side of said Lindo Channel.

Third. A strip of land of varying width on the north side of Chico Creek and running to the center of said creek, extending from the point where the Southern Pacific railroad right of way crosses said creek westerly and down said stream to the mouth thereof; said strip of land being bounded on the north by the 2d and 7th meridian subdivisions of the John Bidwell Rancho and on the south by the center of the channel of Chico Creek.

It is Mrs. Bidwell's proposal to insert in her deed to the State Board of Forestry the following conditions:

A. That the grantee shall not use, cause to be used or allow to be used, directly or indirectly, said land or any part thereof for the purpose of making or selling intoxicating liquors, and should said condition be broken the title herein granted by this deed shall cease, revert to and be vested in said Annie E. K. Bidwell, her heirs or assigns.

B. That the grantor will reserve to herself, during her lifetime, the use and control of such of said lands above described as lie east of the Shasta and Oregon road for all purposes, and that she reserves during her lifetime all present water rights in either of said streams, together with the right to use or sell any sand, gravel, earth or timber within any of the above described tracts as she may deem wise and proper.

And furthermore, it is to be one of the conditions of this conveyance that nothing shall abridge or interfere, now or hereafter, with the custom of closing Lindo Channel during the summer months, at its point of exit at Chico Creek, in order that a steady flow of water may be maintained in the channel of said Chico Creek throughout the entire year.

C. The object of the grantor in conveying this property to the State Board of Forestry is to preserve after her death the forest growth along said water courses; to prevent the diversion and use of the water for private purposes; to minimize the loss of water by evaporation, so that the sub-irrigation of the adjoining lands may be maintained to its natural extent and to maintain the natural beauty of said streams and the integrity of their banks.

It is expected that the State Board of Forestry shall retain the title to the lands herein granted in perpetuity.

Very truly yours,

(Signed) C. C. ROYCE."

This letter describes the location of the property which Mrs. Bidwell proposes to donate and the terms under which she wishes the State to assume its ownership and management. Very little needs to be said regarding it except that the width of the strip along the streams varies somewhat as required by the boundaries of the subdivisions, but averages, in most cases, between 30 and 60 feet. The objects which the proposed donation seeks to accomplish are worthy ones, for the present conditions are important to preserve. Their chief value, however, will accrue to the residents of the town of Chico and Butte County, consequently it is a question for the legislature to decide as to whether the State desires to assume the care of this property.

When the deed was received I was of the impression that the language of section 3, Statutes 1905, Chapter 264, was sufficient for acceptance by the State Board of Forestry. The Attorney General states, however, that the legislature only has the power to accept donations for the State, consequently the deed to this land has been placed in the hands of the State Treasurer for safekeeping. Should the legislature decide to accept this donation I would recomemnd that an appropriation of $1,500 be made for its maintenance during the sixty-first and sixty-second fiscal years.

SUMMARY OF RECOMMENDATIONS.

That a special appropriation of $30,000 be made for the purpose of fire protection, provided that at least fifty counties in this State will expend collectively an equal amount for the same purpose;

That the salary fund of the State Board of Forestry be increased sufficiently to admit of the employment of at least one additional technically-trained forester;

That the unexpended balance of $2,174.58, which was returned to the general fund in the State Treasury at the end of the fifty-eight fiscal year, be added at once to the support fund of the State Board of Forestry for the sixtieth fiscal year;

That the salaries of Assistant State Foresters be increased from $1,200 to $2,400 per year, and that the salary of State Forester be increased from $2,400 to $4,800 per year;

That the support fund of the State Board of Forestry for the sixty-first and sixty-second fiscal years be not less than $30,000, and that the printing fund for the sixty-first and sixty-second fiscal years be increased from $2,500 to $3,500;

That the appropriation for the improvement and maintenance of California Redwood Park for the sixty-first and sixty-second fiscal years be restored to $20,000 instead of $10,000 as at present;

That a special appropriation of $5,000 be made to install the water and sewage systems covered by the plan of the State Engineer; and

That in the event that the legislature accepts the Annie E. K. Bidwell donation, that an appropriation of $1,500 be made to administer the tract during the sixty-first and sixty-second fiscal years.

Respectfully submitted.

G. B. LULL,
State Forester.

FOURTH BIENNIAL REPORT

OF THE

STATE FORESTER

OF THE

STATE OF CALIFORNIA

FRIEND WM. RICHARDSON, SUPERINTENDENT OF STATE PRINTING
SACRAMENTO, CALIFORNIA
1912

CALIFORNIA STATE BOARD OF FORESTRY.

HIRAM W. JOHNSON	Governor
FRANK C. JORDAN	Secretary of State
U. S. WEBB	Attorney General
G. MORRIS HOMANS	State Forester

OFFICE OF STATE FORESTER.

G. MORRIS HOMANS	State Forester
LEON G. JOHNSON	Deputy
RALPH W. SLOSS	Assistant

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LETTER OF TRANSMITTAL.

State Forester's Office,
Sacramento, California, December 5, 1912.

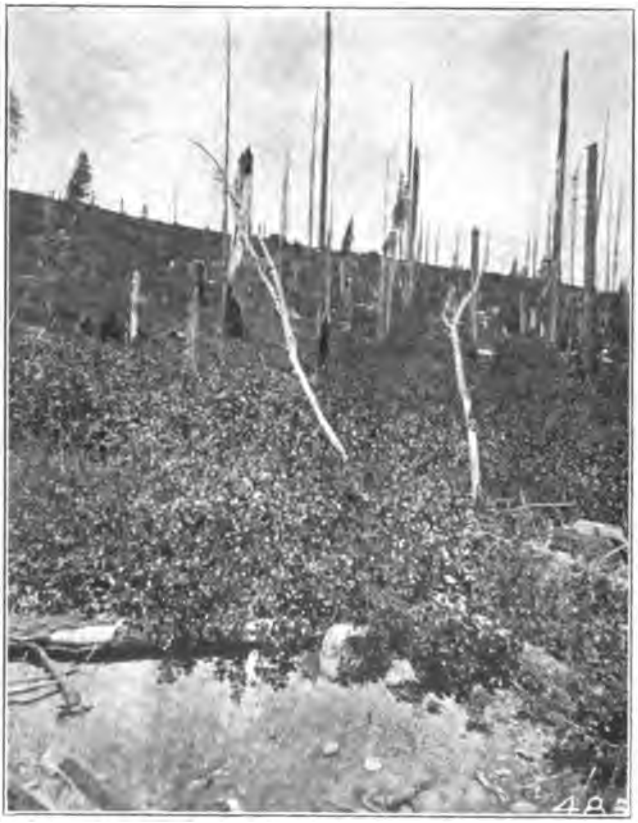
His Excellency,
Hiram W. Johnson,
Governor of California.

Sir:

I have the honor to present herewith a report entitled, "Fourth Biennial Report of the State Forester of the State of California."

Very respectfully,

G. MORRIS HOMANS,
State Forester.



Destructive Lumbering.

Once thickly forested area now a barren waste. Logged too close with no thought for a future crop. Forest fire has completed the destruction and the area is now covered with chaparral which prevents natural reproduction.

INTRODUCTION.

Much of the material contained in this report deals with special forest problems and forest conditions that must be met and solved that a definite and far-sighted state forest policy may eventually be adopted. A limited appropriation has prevented an exhaustive study and investigation, but an effort has been made to show the amount and value of our forest resources; by whom they are owned and how managed; some of the principal forms of waste and damage to which they are subjected; the principles underlying their proper management, and how other states are proceeding with regard to the solution of similar problems.

The National Conservation Congress was held in Indianapolis, October 1 to 4, 1912. Delegates from many states were in attendance, and among them were gentlemen of recognized authority in matters pertaining to the conservation of the natural resources. Some of them were practical exploiters of forest resources; some were scientists who have specialized in various subjects; some were both these, while others were broad-minded, public-spirited citizens interested in the general welfare and betterment of their country. They were all there for a purpose, and here is what they believe in reference to the forests as expressed by the resolutions they adopted:

> "Believing that the necessity of preserving our forests and forest industries is so generally realized that it calls only for constructive support along specific lines:
>
> We recommend the work of the Federal Forest Service, and urge our constituent bodies and all citizens to assist upon more adequate appropriations for this work, and to combat any attempt to break down the integrity of our national forest system by reductions in area or transfer to state authority.
>
> Since Federal coöperation under the Weeks law is stimulating better forest protection by the states, and since the appropriation for such coöperative work is nearly exhausted, we urge appropriation by Congress for its continuance.
>
> We recommend that the Federal troops be made systematically available for emergency service in controlling forest fires.
>
> Deploring the lack of uniform state activity in forest work we emphatically urge the crystallization of effort in the lagging states toward securing the creation of forest departments with definite and ample appropriations, in no case of less than $10,000 per annum, to enable the organization of forest fire work, publicity propaganda, surveys of forest resources and general investigations upon which to base the earliest possible development of perfected and liberally financed forest policies.
>
> ### NEEDED LEGISLATION AND COÖPERATION.
>
> We recommend in all States more liberal appropriation for forest fire prevention, especially for patrol to obviate expenditure for fighting neglected fires, and the expenditure of such effort in the closest possible coöperation with Federal and private protective agencies; and also urge such special legislation and appropriation as may be necessary to stamp out insect and fungous attacks which threaten to spread to other states. We cite for emulation the expenditure by Pennsylvania of $275,000 to combat the chestnut blight, and the large appropriation by Massachusetts to control insect depredation, and urge greater congressional appropriation for similar work by the Bureau of Entomology.
>
> Holding that conservative forest management and reforestation by private owners are very generally discouraged or prevented by our methods of forest taxation, we recommend State legislation to secure the most moderate taxation of forest land consistent with justice of the taxation of the forest crop upon such land only when the crop is harvested and returns revenue wherewith to pay the tax.
>
> We appreciate the increasing support of lumbermen of forestry reforms and sug-

gest particularly to forest owners the study and emulation of the many coöperative patrol associations which are doing extensive and efficient forest fire work and also securing closer relations between private, State and Federal forest agencies. Believing that lumbermen and public have a common object in perpetuating the use of forests, we indorse every means of bringing them together in mutual aid and confidence to this end."

These resolutions are presented for the purpose of showing that forestry propaganda in California is being conducted along constructive and progressive lines.

The chief need in the beginning of a progressive forest policy is the protection of our forests against fire. Some argue that each owner should protect his own holdings while others argue that the State should assume the burden. I incline to the latter opinion. State patrols should be supplemented by private associations of timber owners and by the several counties through their respective boards of supervisors.

The purpose of forestry is to secure the use of our timbered resources in such a way that we ourselves may derive the fullest benefit from them to-day, but also that we may pass them on—unimpaired—so that those who come after us may continue to enjoy the same benefits. To insure this use the forests must be protected. Our forests can be protected from fire under our present laws, provided the legislature makes an appropriation for such a purpose. No change in the existing forest laws is recommended at present.

An effort should be made to secure an appropriation for fire protection and an increase for the support of the board. The latter is needed to conduct special investigations and to continue projects already begun.

If present tendencies remain unchecked, it is apparent that state regulations governing the cutting of timber on private land will be necessary if our forested areas are to produce another crop of merchantable timber. Forestry is not now being practiced on privately owned timbered land. The annual cut is made without reference to the yield, and the future crop is left largely to chance. Further study of the cut-over areas, and of the rate of growth and yield, are necessary before determining what changes can be profitably made by the operators, and what changes are desirable for public good. Legislation, seeking to better present conditions, is likely to be a slow process.

CHAPTER I.

FOREST FIRE.

Fire Report for 1911.

Through the courtesy of the U. S. Forest Service in supplying this office with a list of the fires originating in and near the National Forests, we have been able to complete our record of forest fires for the year 1911.

Fire Season.

The dry season for 1911 commenced no earlier than usual, but continued longer. The first fire occurred in April and the last one in December. The normal fire season is from May 15th to October 15th. August was the worst month, followed by July and November, respectively. Most of the fires occurring between September 1st and December 31st were in the southern portion of the State.

Number and Causes.

There were 1,064 brush, grass and timber fires during the year. Of these, 317 were caused by lightning; 126 were set intentionally; 109 were due to careless campers, and 272 were of unknown origin. The remainder were started in various other ways.

More people go into the woods with each succeeding year, and the chances for starting fires through carelessness will continue to increase. It is right that the use of our forests for recreation be encouraged, but it is essential for the safety of campers, settlers, and property, that proper action be taken to prevent and suppress forest fires.

The following table shows the number and causes of fires during the years 1909, 1910 and 1911:

Causes.	1909.	1910.	1911.
Electric wires	2	---------	---------
Smoking bees	7	---------	---------
Blasting	9	---------	4
Hunters	24	---------	---------
Clearing land	45	---------	---------
Brush burning	---------	54	66
Engines	64	---------	9
Railroads	---------	17	27
Sawmills	---------	17	17
Tobacco	---------	---------	16
Incendiary	39	70	126
Lightning	79	119	317
Campers	119	122	109
Miscellaneous	---------	76	101
Unknown	250	263	272
Totals	638	738	1,064

Area Burned Over, and Damaged.

The total area burned over by fire was 282,284 acres; 55,182 acres were timbered land and 227,102 acres were brush and grass land. Notwithstanding the fact that the fire season was longer than the average, the total area burned was much less than that of each of the previous two years. This is accounted for largely because of the increased efficiency of the United States Forest Service. More trails and telephone lines have been constructed, enabling the rangers to reach a fire more promptly than heretofore. These improvements make it possible for them to be notified at once of existing fires. A good skeleton of permanent improvement work now exists, and each year's extension lessens the chances for extensive fires.

The actual damage to timber and grazing lands amounted to $128,451.50. There was an unestimated, and perhaps irreparable damage to watersheds.

The following table shows comparative figures for the last three years:

Year.	Area burned over—acres.			Amount of damage.
	Timber.	Open.	Total.	
1909	76,780	279,589	357,269	$100,000 00
1910	216,069	303,394	519,463	628,989 20
1911	55,182	227,102	282,284	128,451 50

During 1911 the Forest Service fought 797 fires at an expense of $63,691.88.

FIRE REPORT FOR 1912.*

Number and Causes.

This office has definite record of 85 fires occurring outside the national forests; these fires were reported by the voluntary firewardens. Of this number 23 were of unknown origin; 14 were caused by hunters and campers (hunters start fires to drive out game and campers usually leave their fires unattended); 14 through careless brush burning; 11 by tobacco and the others were from various causes such as smoking bees, blasting, lightning, sparks from railroad locomotives and from donkey engines not equipped with spark arresters.

Through the courtesy of the Forest Service we are also able to report an additional number of 545 fires occurring within or just outside the national forests, making a total of 630 fires reported so far. These figures are also incomplete since all reports are not in for the entire year.

The total area burned was 92,920 acres. Much of this was timber land and considerable merchantable timber was destroyed.

Of the 85 fires which were reported by the voluntary State firewardens and of which we have definite record, 469 acres of timber land were burned, 30,647 acres of grazing land, and 34,804 acres brush-covered land. Other damage was done to fences, buildings, hay and grain; and, in one instance, several acres of a valuable olive orchard were burned. This direct loss amounted approximately to $12,430. It took 1,908 men, fighting 1,272 hours in all, to extinguish these 85 fires. If these men had been reimbursed for their services at the rate of 25 cents per hour the State would have had to pay $318.00 for labor. Tools, supplies, and transportation would have been an added cost. The 545 fires reported by the Forest Service cost that institution approximately $20,000.

The first fire of this year was reported in February, and only a few were reported during October. August was the worst month—252 fires occurring during that period.

It will be noticed that a lesser number of fires occurred in 1912 than in 1911. This reduction is very gratifying and praise as well as thanks are due the firewardens who have done so much, and given so much of their time (and often of their personal funds) toward combating fires. The numerous firewardens distributed over the State have had a very beneficial influence. They are all public-spirited citizens and are, for the most part, men of experience and discretion, who, through their earnest efforts, have been instrumental in creating a very favorable sentiment in regard to the careful use of fire in the woods.

Firewardens.

State firewardens serve without compensation for their services and often incur considerable expense. For this they cannot be reimbursed by the State since there is no appropriation for this purpose. It is imperative that the State make an appropriation for fire protection and for paying the necessary expenses incurred when fires do occur. It is unreasonable to ask a volunteer to spend a day, perhaps days, fighting fire, neglecting his personal business, and then not reimburse him for his time and services. At present, this is the deplorable state of affairs. It is right that a man should protect his own property to a reasonable extent, without compensation, the State expects that, but the volunteer who goes out and fights fire does much more. His help keeps the fire from spreading, thereby valuable timber is conserved; he helps to protect the watershed which is so necessary to insure a constant stream flow so that we may have water for irrigation and domestic use, and, in this, the whole State shares the good that results from his efforts, and a system that requires him to give so much is most unfair. Therefore, any sum that the State would spend in this direction would be well and profitably spent.

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*The figures are complete to November 1, 1912, the date this data was compiled.

So far we have been without an appropriation for forest protection, consequently the State Board of Forestry has been prevented from organizing fire patrols and in taking the first steps necessary to establish forestry principles.

Unless our cut-over areas are protected from fire, it will be impossible to interest private capital in reforesting denuded areas. There are over one and a half million acres of logged-over land that need protection if a second crop of timber is to be grown. Thus far, the work of protection has been undertaken by the voluntary firewardens of whom there are about eleven hundred. These officers have the power of peace officers. They may make arrests for violations of the forest laws and can compel the attendance of citizens to fight fires. Through their efforts several thousand warning notices have been posted along frequented trails and in camping places, and copies of the forest laws have been distributed among campers and given to others who were interested. In this way coöperation has been sought, and, as far as possible, the danger as well as the proper use of fire has been called to the attention of as many as was possible.

Forest fires in California cannot be altogether eliminated since California has long, dry seasons. Lightning will always be a factor and one that cannot be prevented. But the number of fires can be greatly reduced if an efficient fire patrol system were inaugurated. During the next session of the legislature another strong effort will be made to secure a much needed appropriation for this purpose.

Prosecutions.

Forty arrests for violations of the forest laws were made during the year of 1911. In 21 cases fines were imposed and collected; in 3 cases the offenders were acquitted, and 7 cases were dismissed for want of sufficient evidence. In 6 cases, the fines of the guilty offenders, because of various circumstances, were suspended on condition that similar offenses would not again be committed. The intent in causing forest fires to be started, in two cases, was so malicious that the offenders had to choose between paying a fine or serving a jail sentence. They chose the latter. In other instances, where inexcusable carelessness resulted in fires and the accused were without funds, the justices released them on condition that the fines be paid within a reasonable period. A conviction was secured in the remaining case but no fine collected because of old age. Firewardens did splendid work in bringing the cases to trial, and the justices in prosecuting them.

Many of the wardens realize the uselessness of bringing cases in certain localities because of the attitude of the justices of the peace. There seems to be a peculiar attitude, in some parts of the State, toward forest fires. Their danger is not fully appreciated. The laxity with which many cases are prosecuted is largely responsible for the increase of incendiary fires.

The table on page 12 shows the counties in which the forty cases were tried, and their disposition.

For the year 1912, with the exception of the months of November and December, thirty-nine arrests were made for violations of the forest laws. Of this number, twenty-nine cases were successfully prosecuted, convictions secured and the imposed fines collected. In one case, the offender was acquitted; three offenders were released; two dismissed; in two cases, while fines were imposed, a portion of the fines was suspended; and in the case of another offender, although pleading guilty to the offense with which he was charged, the extenuating circumstances were such that he was placed upon probation for six months in lieu of a fine.

This office has information which tends to show that many of the fires reported were of incendiary origin. They started, for the most part, in remote places and by the time a volunteer fire crew could be assembled and reach the scene, no definite clew could be established.

Stockmen and water users are the heaviest losers. It has been demonstrated that the volunteer firewarden system is inadequate to prevent many of the larger fires and to successfully prosecute the offenders. A paid fire patrol, maintained by the State, must be established.

Violations of the forest laws for not providing donkey engines, locomotives, sawmill stacks and traction engines with spark arresters, are numerous. The origin of many fires, that were not formally reported, could be traced to this source. A systematic inspection of such stacks must be provided for.

The table on page 13 gives a list of the prosecutions to date of November 1, 1912.

FIRE PROSECUTIONS FOR CALENDAR YEAR 1911.

Case.	County.	Tried by.	Place of trial.	Fine.	Sentence.	Remarks.
1	Butte	Justice Storey	Sterling City	$10 00		
2	Butte	Justice Storey	Sterling City	10 00		
3	Butte	Justice Storey	Sterling City	10 00		
4	Butte	Justice Storey	Sterling City	10 00		
5	Calaveras	Justice Anderson	Murphys	50 00		
6	Fresno	Justice of Peace	Fresno			Sentence dismissed.
7	Kern	Judge Brown	Maricopa	7 50		
8	Kern	Judge Brown	Maricopa	7 50		
9	Kern	Judge Brown	Maricopa	7 50		
10	Kern	Judge Brown	Maricopa	7 50		
11	Los Angeles	Justice J. Holmes	Los Angeles	30 00	30 days	Served sentence.
12	Los Angeles	Justice Young	Los Angeles	15 00	15 days	Sentence suspended six months.
13	Los Angeles	Judge Glover	Los Angeles	50 00		
14	Los Angeles	Judge Glover	Los Angeles	50 00		
15	Los Angeles	Judge Glover	Los Angeles	50 00		
16	Orange	Justice Fullerton	Orange	50 00		Fine excused—old man.
17	Santa Clara	District Attorney Free	Los Gatos	50 00		
18	Santa Clara	District Attorney Free	Los Gatos	50 00		
19	San Diego	Justice Bloom	San Diego	70 00		
20	San Diego	Justice Dodson	San Diego	50 00		No fine imposed—dismissed.
21	San Diego	Justice Wisdom	San Diego	50 00		Suspended sentence.
22	San Diego	Justice Wisdom	San Diego	10 00		
23	San Diego	Justice Wisdom	San Diego	100 00	30 days	Served 30 days in jail.
24	San Diego	Justice Wisdom	San Diego	50 00		Sentence suspended.
25	San Diego	Justice Wisdom	San Diego	50 00		Sentence suspended.
26	San Diego	Justice Burtch	San Diego	50 00		$40 suspended.
27	San Diego	Justice Burtch	San Diego	45 00		$10 collected only.
28	San Diego	Justice Dodson	San Diego	50 00		
29	Shasta					No conviction.
30	San Bernardino					Dismissed—paroled patient from Patton.
31	Sierra					Dismissed—offender paid all costs of fire.
32	Sierra					Dismissed—offender paid all costs of fire.
33	Siskiyou	Justice of Peace	Yreka	50 00		
34	Trinity	Judge Dockery	Weaverville	10 00		
35	Ventura	Judge Knox	Ventura			Acquitted.
36	Ventura	Judge Knox	Ventura	10 00		Suspended.
37	Ventura	Judge Knox	Ventura	10 00		Suspended.
38	Ventura	Judge Knox	Ventura	10 00		Acquitted.
39	Ventura	Judge Knox	Ventura			Acquitted.
40	Los Angeles	Justice of Peace	Los Angeles			Dismissed.

FIRE PROSECUTIONS FOR CALENDAR YEAR 1912, UP TO NOVEMBER.*

Case.	County.	Tried by.	Place of trial.	Fine.	Sentence.	Remarks.
1	Fresno	District Attorney	Fresno			Acquitted.
2	Fresno	Justice Geo. B. Graham	Fresno	$50 00		
3	Fresno	Justice Geo. B. Graham	Fresno	30 00		
4	Los Angeles	Judge Melrose	Tropico	100 00		
5	Los Angeles	Justice Geo. Glover	Azusa	50 00		
6	Los Angeles	Justice Barnes	Los Angeles	25 00		
7	Los Angeles	Judge Dunham	Pasadena	50 00		
8	Los Angeles	Justice of the Peace	Los Angeles	10 00		
9	Los Angeles	Justice of the Peace	Los Angeles	50 00		
10	Los Angeles	Justice of the Peace	Los Angeles	50 00		Leaving camp fire unextinguished.
11	Los Angeles	Justice E. Barnes	Claremont	25 00		
12	Los Angeles	Judge Young	Los Angeles			Released.
13	Los Angeles	Judge Young	Los Angeles			Released.
14	Los Angeles	Justice E. Barnes	Pomona	25 00		
15	Los Angeles	Judge McDonald	Pasadena	125 00		
16	Los Angeles	Judge Melrose	Los Angeles	50 00		Fine remitted.
17	Los Angeles	Justice Geo. E. Glover	Los Angeles	25 00		Failure to comply with summons to fight fire.
18	Los Angeles	Justice Geo. E. Glover	Azusa	25 00		Refusing to fight fire.
19	Los Angeles	Justice Geo. E. Glover	Los Angeles			Refusing to fight fire. Released upon proof of physical disability.
20	Mariposa	Justice John Endean	Coulterville	50 00		
21	Riverside	Justice of the Peace	Banning	25 00		Refusing to fight fire.
22	Riverside	Justice Geo. L. Wing	Banning	50 00		
23	Riverside	Justice of the Peace	Riverside	25 00		Leaving camp fire unextinguished.
24	Riverside	Justice of the Peace	Riverside	25 00		Leaving camp fire unextinguished.
25	San Bernardino	Justice Pittman	San Bernardino	10 00		Leaving camp fire unextinguished.
26	San Bernardino	Justice Pittman	San Bernardino	10 00		Leaving camp fire unextinguished.
27	San Bernardino	Justice Pittman	San Bernardino	10 00		Leaving camp fire unextinguished.
28	San Bernardino	Justice Pittman	San Bernardino	10 00		Leaving camp fire unextinguished.
29	San Bernardino	Justice of the Peace	Redlands	50 00		
30	San Bernardino	Justice of the Peace	Ontario			These three men were fined $50 jointly for the one offense of leaving a camp fire unextinguished.
31	San Bernardino	Justice of the Peace	Ontario	50 00		
32	San Bernardino	Justice of the Peace	Ontario			
33	San Diego	Justice J. F. Kelly	San Diego			Dismissed.
34	San Diego	Justice J. F. Kelly	San Diego			Dismissed.
35	San Diego	Justice J. F. Kelly	San Diego	50 00		$25 of this fine was suspended.
36	San Diego	Justice J. F. Kelly	San Diego	50 00		
37	San Diego	Justice J. F. Kelly	San Diego	50 00		$40 of this fine was suspended.
38	San Diego	Justice J. F. Kelly	San Diego			Pleaded guilty. Was placed on probation for 6 months.
39	Yuba	Justice Fraser	Camptonville	50 00		

*These figures are necessarily incomplete because all reports are not in for the entire year.

Plate I. Virgin forest.

A typical stand of virgin yellow pine and white fir. This area has been exempt from fire for many years and its density has reached the maximum. The young growth coming in will form the basis for a new crop when the area is logged. A fire would kill all this young growth and do an unestimated damage to the mature trees. Over 5,000,000 acres of virgin timber in California are under private ownership. All of it needs protection.

Protective Associations.

At present three Forest Fire Associations exist in California. They are the Stockmen's Protective Association, the Redwood Fire and Protective Association, and the California Forest Protective Association. The latter two have done but little toward forest fire prevention. They were but recently organized, and it is yet too early to foretell what they will be able to accomplish. On the other hand, the Stockmen's Association has done much and is the strongest of the three associations.

This association was organized on May 15, 1904, by stockmen from Alameda and San Joaquin counties, the object being "to promote the stock and range interests of its members, especially for protection against range fires." The members are assessed one dollar per year and represent 250,000 acres of land. The State Forester coöperates with these associations in every way possible. This association maintains mounted patrolmen during the dry season. These men report regularly to the county firewardens and the State Forester. An efficient system therefore is in vogue and much good is being done.

The Redwood Fire and Protective Association of Fort Bragg is composed of the redwood lumbermen. They have a different problem before them, for the redwood suffers less from fire than other trees. Most of the severe fires of the present time follow lumbering. After the trees are felled the slash and general débris is intentionally fired to facilitate logging. The redwood country is the only region where slash is intentionally fired. The trees are felled, peeled, trimmed, and sawed into logs, then the whole felling area is set on fire. There is a strong sentiment against the use of fire in cleaning up débris, but until some other less wasteful method is demonstrated, the use of fire will be continued. However, the association has done much good in constructing many miles of fire trails in Mendocino County during the past season. This system of fire trails, when completed, will be of great benefit to all owners of timber in that immediate section. All patrolmen in the employ of this association are also state voluntary firewardens. These patrolmen work only during the fire season.

The California Forest Protective Association was organized in March, 1912, by lumbermen representing every section of the State, presumably for the purpose of fire prevention and protection. So far nothing has been done and it will be interesting to note the policies which they may adopt.

County Work.

During the calendar year of 1912 twenty-two counties expended money for forest fire protection amounting to $10,975.07. The amount expended by any one county exceeded $600 in only five cases. Some of the counties coöperated with the U. S. Forest Service and two of them with the Stockmen's Protective Association.

Weeks Law.

Section 2 of the Weeks law authorizes the U. S. Secretary of Agriculture to coöperate with states in protecting forested watersheds of navigable streams from fire. An appropriation of $200,000 was made for this purpose. The law provides that protection must be confined to forested watersheds of navigable streams; the state must have provided by law for a system of forest fire protection; and the Federal expenditure in any state must not exceed, in any fiscal year, the amount appropriated by the state for the same purpose.

The law is carried out by the Forest Service. No state can secure more than $10,000 in any one year. The plan is to assist as many states as possible that the greater educational value may be received. No appropriation having been made for protection, California was unable to avail herself of the provisions of the Weeks law.

Federal Coöperation.

A good framework of protection is already in existence and one that will be most useful to the state when funds are provided.

The federal forest rangers (about 250) serve as voluntary firewardens. The National Forests are patroled, and a few lookout stations have been built. Telephone lines are being extended as rapidly as funds will permit.

During the summer of 1912 the U. S. Post Office Department made provision for lending its support to state officers in the prevention of forest fires. The following order shows in what they are willing to help:

Order No. 6316.

"*To the Postmaster.*

SIR: The following instructions are promulgated for the guidance of the postal employees concerned:

In accordance with the request of the Secretary of Agriculture, this Department has arranged a plan of coöperation with State and National Forest officers whereby rural and star route carriers shall report forest fires discovered by them along their routes to persons designated by the State and National authorities to receive such intelligence.

The State and National authorities will inform postmasters as to whom the discovery of fires shall be reported, and each rural carrier should be directed to coöperate to the fullest extent with such authorities in the manner agreed upon, namely, that the carrier shall report a fire to the nearest State firewarden or National Forest officer on his route, or if no such officer or warden lives on the route, to arrange through some responsible citizen to have him notified, by telephone, if possible. Star route contractors and carriers are included in the plan of coöperation and should be requested to report the discovery of fires in the same manner as will be done by the rural carriers.

Postmasters in or near National Forests are also directed to report fires to the nearest Forest officer.

Respectfully,

P. V. DEGRAW,
Fourth Assistant Postmaster General."

Rural and star route carriers traverse hundreds of miles of country in the State that is subject to fires. Such assistance will be immensely valuable to district fire rangers and will cost the State nothing. Until paid men are provided for, however, but little advantage can be gained from such generous coöperation.

Organization of Patrol.

The State should be divided into patrol districts; the number depending entirely upon the appropriation available for fire prevention and suppression. A fire ranger will be in charge of each district who shall devote his entire time to patrol, extinguishing such fires as do occur, posting warning notices and in securing the coöperation of those whose business or pleasure takes them into forest or brush-covered regions. Logged-off areas covered with inflammable material or other sources of danger need to be inspected with the view of determining whether they constitute a menace as defined by present laws.

A general educational campaign against fires is most essential. Many of the fires can be prevented by exercising a little more care and, in time, these will probably occur but seldom, or not at all.

Each ranger will have definite headquarters. He will keep a diary and report briefly, at the end of each week, a summary of the work accomplished. In addition, reports, on special forms, will be rendered for each fire attended, showing the area and extent, damage, time required to bring it under control, cost, and probable cause. Similar reports will be rendered for each arrest made for violations of the forest laws. As other duties will permit tentative plans will be prepared by each ranger showing the approximate location of lookout stations and telephone lines that need to be built to insure more thorough and efficient protection. Such work must proceed slowly in order to avoid an unwise choice of location.

The necessity for forests is so generally recognized, and the need for their protection is so well known, that a further discussion is probably unnecessary. There remains the importance of providing funds with which to protect the forest resources of our State.

CHAPTER II.

OWNERSHIP OF TIMBER LANDS.

In order that the people may the more readily determine what state policy shall be adopted to make our forests serve the greater uses to which they can be put, a study of the amount and ownership of timber lands was made during the winter of 1911 and 1912. A type map has been issued showing, approximately, the occurrence of merchantable forests, logged off and chaparral areas. This year, however, each area of 320 acres and over was secured by legal subdivision, county and owner. The data presented in this chapter show the amount of timber and cut-over land that are assessed as such. Agents working under the direction of the State Forester transferred the holdings to our plats as they appeared in each county assessor's office. The discrepancy between the assessed acreage in private ownership and the estimated acreage is accounted for chiefly by the listing, for the purposes of taxation, of much timber land as grazing land. The county assessors will undoubtedly be grateful to have their attention called to such cases of which any one may have special knowledge.

A map showing these holdings could not be published by this department because of limited appropriations, so the data was loaned to the Conservation Commission, which will issue it as a part of their report. The title is "Timbered Area, State of California." The map shows all timber holdings in the State aggregating 20,000 acres or more to the holding.

There are 5,823,440 acres (holdings of 320 acres and over) assessed as timber or cut-over lands. Of this amount, 4,737,554 acres are timbered, and 1,085,886 acres are cut-over land.

The ten largest holdings comprise 2,448,094 acres, or approximately 42 per cent of all the privately owned timber and cut-over land in the State. They are as follows: Central Pacific Railroad (S. P.), 921,311 acres; T. B. Walker and associates, 673,665 acres; McCloud River Lumber Company, 232,063 acres; Diamond Match Company, 159,499 acres; Hammond Lumber Company, 94,760 acres; Union Lumber Company, 80,350 acres; L. E. White Lumber Company, 79,540 acres; Weed Lumber Company, 71,458 acres; C. A. Smith, 69,768 acres, and Sierra Nevada Wood and Lumber Company, 65,680 acres. The holdings under 2,000 acres are too numerous to publish, but they are summarized in the following table:

Summary of timber holdings.

Size of holdings.	Number of holdings.	Amount in acres.		Total.
		Timber.	Cut-over.	
Below 1,000 acres	1,087	460,098	79,071	539,164
1,000 to 2,000 acres	196	195,687	59,321	255,008
2,000 acres and over	286	4,081,794	947,494	5,029,288
Grand total		4,737,554	1,085,886	5,823,440

The table showing the owners, amounts, location by county, of timber and cut-over holdings aggregating 2,000 acres and over to the holding, is omitted because of an insufficient appropriation for printing.

Active lumbering operations are being conducted on many of the properties, and many of the others, including some of the larger ones, are being held for various reasons. The forested area of the State is being depleted very rapidly, and far more timber is being removed annually than is being produced. It is estimated that nearly 5,000,000 acres of once heavily timbered land has, since logging, given way to chaparral growth, and because of cutting without reference to the future, and repeated ground fires, and can not now reproduce another merchantable crop without resorting to artificial reforestation. Under present conditions there is nothing to prevent the continuance of similar methods resulting in similar deplorable conditions.

I am of the opinion that wise and far-sighted State regulations governing the cutting of timber on private lands are of public necessity, and that the lumber industry should be regulated for public good just as other "big business" has been regulated when it was shown that by so doing public interests were the better served as well as preserved. Such measures should accomplish two definite purposes; one being to provide for a continuous timber supply, and the other to conserve water. By accomplishing the latter other beneficial results will follow.

Just how to accomplish desired results is difficult to determine. There is every reason to believe that the state will, eventually, require that timber lands shall be under conservative forest management, and that it will go far toward defining what constitutes such management. Before such a plan can be formulated it is essential that systematic investigations shall continue in matters pertaining to the rate of growth and yield of our commercial forests. So far, students of forestry seem to be unanimous in the opinion that state legislation should be confined for the present to forest protection, taxation, acquirement of state forests, and to education and scientific investigations.

PLATE II. Area logged under Government regulations.

Representative cut-over land in a National Forest. Note the excellent condition of the area. The slash has been carefully piled and burned. Thrifty seed trees of the most valuable species have been left to reseed the area. Nothing under eighteen inches in diameter was cut, so another valuable timber crop is assured.

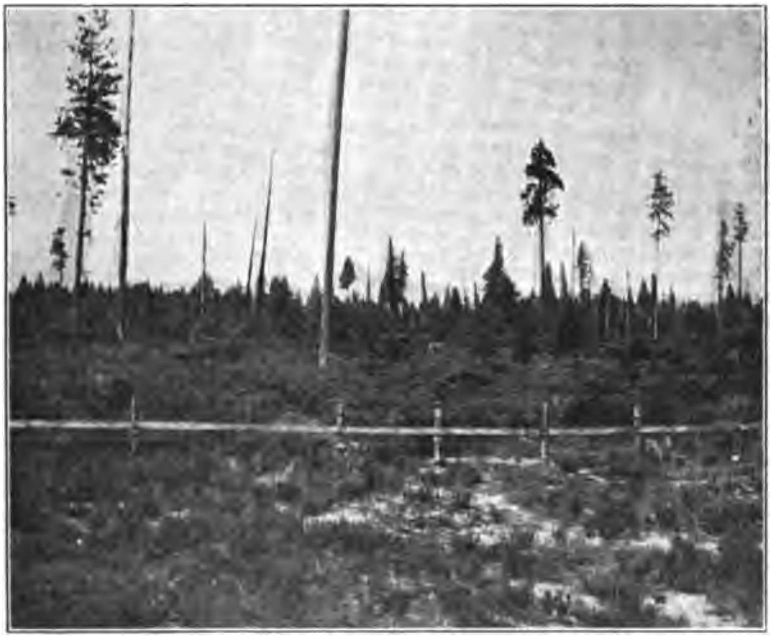

PLATE III. Area logged without restrictions.

Over a million acres of once virgin timber have been "skinned" like the area shown in the picture. Future yield has been left to chance. Such land as this is unfit for anything except the growing of timber. Destructive lumbering has changed the area into a barren waste that is already being claimed by chaparral. A fire would destroy the few remaining trees and give the chaparral permanent possession. With adequate protection these lands will eventually bear another crop of trees.

CHAPTER III.

CUT-OVER LAND STUDY.

Introduction.

With the exhaustion of timber in the New England States, the lumbermen were forced to seek other localities for their source of supply and the region around the Great Lakes became the next great scene of their activities. While operations here were still in full sway, the completion of the transcontinental railroads brought the great belt of timber on the Pacific coast within the reach of the eastern markets. Some of the more enterprising lumbermen, taking heed of the steadily increasing demand for lumber, turned their attention to the vast forest resources of California and began acquiring timber land.

At the time that California was admitted as a State, almost all of the timber land was in the possession of the Federal Government. A few of the original Spanish grants contained some timber land. The early settlers regarded the timber land as being of little value and sought for precious minerals or good ranch sites. As a result, when the lumbermen from the Lake States turned their attention to California, they found that practically the entire timbered area was still in the public domain, and they lost no time in using every available means to gain possession.

Claims were acquired under the Homestead Law, the Timber and Stone Act, the Swamp Land Act, and the mining laws. The public land laws were violated to such an extent and so openly that they accomplished little else than ridding the people of their natural heritage. Timber frauds were perpetrated more and more openly. Dummy locators were imported by the score from eastern cities. Some of them could scarcely understand English, yet they were "located" on choice timber claims with the agreement that the locators should gain possession upon the issuance of patent. The dummy seldom resided on the land—that was unnecessary. From $100 to $300 was the prevailing price paid for the title to such claims.

Most of the choice timber lands were appropriated before the Government awoke to the fact that urgent action was necessary if it wished to preserve any of its timber. On March 3, 1891, a law was passed which enabled the President to withdraw timber lands from the public domain, and set them aside as forest reserves. At the present time there are 27,557,393 acres of land in the National Forests of California. Of this amount 7,786,306 acres are timber land and 4,317,904 acres are woodlands.* This area has a stand of approximately 114.4† billion feet B. M. of timber worth on the stump about 228 million dollars.

There are about 8½ million acres of privately owned timber land. They contain 248.1† billion feet B. M., and they are worth more than 500 million dollars.

The purpose of this study is to bring before the people of California the exact conditions prevailing on our cut-over lands. The redwood lands present a problem peculiar to themselves and have not been considered in this study.

The cut-over lands must furnish the future timber supply. At the present rate of cutting our supply of standing timber will be exhausted in a few generations. The growing of a crop of timber is essentially a long time investment, and under the present system of taxation, one that the lumberman does not feel able to undertake. The extremely close cutting now being practiced by most companies is probably due in part to our system of taxation. In another part of the report, the evils of this system are fully discussed, and it is shown how private reforestation is discouraged.

A large proportion of this cut-over land is unfit for anything except the growing of timber, but if a future stand is to be produced, it must eventually fall to the State to undertake the work.

One of the most important factors in the work of reforestation is fire protection. The results of this study show conclusively that much of the cut-over land will reforest itself naturally from a very few seed trees if fire is excluded. In the investigation that was carried on, particular attention was paid to (1) Fire protection systems or lack of protection; (2) Unnecessary waste in logging; (3) Damage to the watersheds; (4) The condition in which the lands were left after cutting, and (5) What was being done with the lands after logging.

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*Figures compiled by the U. S. Forest Service.

†"The Lumber Industry," Bureau of Corporations, 1911.

A preliminary investigation was made in the winter of 1911-12 to determine the area and ownership of the timbered and cut-over lands of the State. In securing this total, all holdings of over 320 acres were considered. It was found that in all there are 4,737,554 acres of timbered land and 1,085,886 acres of cut-over land in private ownership. Excluding the redwood lands, there remains approximately 3,600,000 acres of pine timber land and 825,000 acres of pine cut-over lands. Inadequate appropriations would not permit of a detailed study of all this area, but ten lumber companies were selected, representing a total of 552,303 acres of which 365,545 acres are timbered land and 186,758 acres are cut-over land. A careful examination was made on these holdings and the conditions found may safely be said to be representative of those prevailing throughout almost all of our pine lands.

Forest Composition.

The timbered areas studied are representative of the commercial forests extending from the Oregon boundary, south through the Sierra Mountains to the southern extremity of their natural range. They necessarily vary in composition, density of stand and quality of timber. Yellow and sugar pines predominate and are the more valuable species. They occur scatteringly, in association with other species on some areas, and form pure stands on others. South of Mount Shasta yellow pine gives way to sugar pine, Douglas fir, white fir and incense cedar, which, together produce a mixed stand, varying in the proportion of species according to topographical, soil and moisture conditions. Jeffrey pine makes its appearance on the higher elevations from Sierra County south to Fresno County.

Douglas fir occurs most extensively in the north where it often predominates on the north and east slopes, while the bigtree is confined to the southern region.

OCCURRENCE OF SPECIES.

Yellow pine (*Pinus ponderosa* Lawson).

Yellow pine occurs throughout the entire area, either in pure stands or in mixture with other species. It occurs on all soils and on slopes of all inclinations and aspects. However, it is not found in great abundance on the north slopes, but does best on the benches and gentle slopes on the west slopes of the Sierra. In its best growth it reaches a maximum diameter of six to seven feet and a maximum height of 175 to 200 feet. Its bole is cylindrical, with a slight taper and is usually clear for about one half its length. It bears seed annually, but best seed years occur every three to five years. The seed has a high percentage of germination and the seedlings will grow wherever there is sufficient light.

Sugar pine (*Pinus lambertiana* Dougl.).

Sugar pine was never found growing in pure stands, but always in mixture with some other species. It occurs usually at the higher elevations and was not noted below 3,000 feet. At the lower elevations it was found chiefly in mixture with yellow pine and incense cedar. At the higher elevations, white fir and yellow pine were its chief associates and in the south it was also found in mixture with the big trees. It was found on a variety of soils, but made its best growth in cool, moist situations on north and east slopes and in cañons and ravines. In its best growth it reaches a maximum diameter of 6 to 7 feet and a maximum height of 160 to 180 feet. A little seed is produced locally each year, but good seed years are irregular, generally from four to seven years apart.

Jeffrey pine (*Pinus jeffreyi* "Oreg. Com.").

Jeffrey pine is similar in size and appearance to the western yellow pine. It occurs commonly between the upper altitudes of western yellow pine and of white fir, with no sharp line between its range and the ranges of these trees. The best commercial growth is made between 5,000 and 6,500 feet elevation, on well-drained, loose, sandy soil, with abundant moisture. It was found occasionally in nearly pure stands and often predominating in mixture, where it associates chiefly with western yellow pine, lodgepole pine, sugar pine, white and red firs, and incense cedar.

Douglas fir (*Pseudotsuga taxifolia* (Poir.) Britt).

Douglas fir was found chiefly in association with yellow pine, sugar pine, white fir, and incense cedar. It occurs on all slopes, but seems to prefer the sheltered slopes and cañons to the more exposed situations. It was noted in almost pure stands on the steep north exposures in the Castle Creek watershed, Shasta County. In this State it attains a maximum diameter of 4 to 6 feet and a maximum height of 125 to 150 feet. From north to south, the per cent of Douglas fir decreases, and very little was found in the southern part of the area examined. It grows on a variety of soils, but demands considerable soil moisture and humidity to make a good growth. It produces seed every year, and especially good seed years occur at intervals of about three years.

White fir (*Abies concolor* (Gord.) Parry).

White fir was noted in every tract that was examined. It occurred on a variety of soils, but appeared to prefer the moist situations, and made its best growth on rich, moist loam. It is a large tree, often attaining a diameter of 4 to 5 feet and a height of 150 feet in the most favorable situations. It is usually found in mixture with yellow pine, incense cedar, sugar pine, and Douglas fir. In the southern part of the State it was noted in mixture with the big trees and sugar pine. Except in dense stands, it does not clear itself over one third to one half its length, and in many instances its lower branches are found clinging in a dry mass around the trunk. It is a good seeder and produces some seed every year. Good seed years occur every two or three years. The seed will germinate in almost any kind of seed bed and this fact renders it aggressive for reproduction on cut-over lands.

Incense cedar (*Libocedrus decurrens* Torrey).

Incense cedar was never found in pure stands, but usually occurred as a subordinate tree in mixture with other species. In the northern part of the State, it was found forming a small part of an otherwise pure stand of yellow pine. It was also found in mixture with yellow pine, sugar pine, Douglas and white fir. It grows on a variety of soils, and while it prefers cool, moist soils, it will grow on very dry situations. It has a rapidly tapering trunk and seldom reaches a height of over 100 feet. The maximum diameter noted was about 4 feet. Considerable seed is borne locally each year, but especially good seed trees occur every two or three years.

Tolerance.

By tolerance is meant the ability to endure shade. A tolerant specie is one capable of enduring more or less heavy shade, and an intolerant specie is one that is unable to endure shade. Successful reproduction depends not only on a proper distribution of seed, but also on the conditions for germination and for the development of the seedlings. In order to fully understand what constitutes the proper conditions, it is necessary to know which species are tolerant and which are intolerant.

The criteria used in judging the tolerance of a specie are its ability to endure shade, its method of branching in close stands, and its habits of retaining living branches. A tolerant species usually had heavy foliage with living branches, in dense stands, extending well down the bole, while an intolerant species in a dense stand has a clean bole with a small crown.

Sugar pine.

This specie will stand considerable shade for the first ten years, after which it requires a direct light. As it approaches maturity, it becomes very intolerant, even more so than the yellow pine. It prunes itself well, especially in dense stands.

Yellow pine.

The yellow pine is intolerant throughout life. In the seedling stage it will endure a certain amount of shade, and the young trees are often found in dense thickets. After they reach an age of from ten to twenty years, they thin out rapidly and the trees over 20 feet high demand light.

Jeffrey pine.

Jeffrey pine is fairly tolerant when young, ranking between yellow and sugar pine. Its seedlings and saplings make a fair growth under partial shade. In later life it becomes as intolerant of shade as western yellow pine.

Douglas fir.

Douglas fir is moderately tolerant throughout its life. In the seedling stage it appears to demand a partial shade but it becomes less tolerant as it approaches maturity.

White fir.

This species is very tolerant, more so than any of the other species studied. Owing to its great tolerance, it cleans itself poorly, and retains its lower branches even in dense stands.

Incense cedar.

This species is next to white fir in tolerance. It is found in the seedling stage under dense shade, but it requires more light as it grows older.

Reproduction.

The seedlings of the sugar pine were found in greatest abundance on well-drained sandy, black loam areas where there was a considerable amount of humus. The seeds scatter in bunches near the old trees. Trees under 20 inches in diameter do not produce much seed. It is not a prolific seeder. Some seed is produced locally each year, but seedling counts made from thickets indicate that good seed years occur from four to seven years apart.

The yellow pine seeds annually, but the best seed years occur every three to five years. The seedlings are usually found in openings or down slopes and ravines where the wind may have blown the seed. They are found on all soils, but appear to prefer a well-drained, fresh soil. The seed does not carry far in dense stands, but in open forests it is scattered about 500 feet in the direction of the prevailing wind.

PLATE IV. A menace to reproduction.

Débris such as this constitutes a grave fire menace. A fire on this area would extend to live timber before it could be extinguished. The few remaining trees would be destroyed and the area would become a permanent waste. Several hundred thousand acres in this State are in a dangerous condition because the slash has been left as shown in this picture. The Government requires all slash on the National Forests to be piled and burned.

Douglas fir is nearly as prolific a seeder as yellow pine. Considerable seed is produced locally each year, and good seed years occur every three or four years. A fairly moist soil, free from duff, appears to be best for germination.

White fir is also a good seeder. Some seed is produced each year, but good seed years occur at intervals of two or three years. The character of the seed bed appears to be of little importance and the seed will germinate under almost any condition. However, some soil moisture is apparently desirable.

Partial shade is favorable to the early seedling stage of the incense cedar. Reproduction is good, both under old trees and in the open places. It is a prolific seeder, and all trees, no matter of what quality, appear to produce seed. Some seed is borne locally each year and good seed years occur every two or three years.

Rate of Growth.

Determining the rate of growth of our forest trees is a matter of great importance and one that cannot be overestimated. It is this factor, more than any other, that finally determines to what extent forestry can be made a profitable business proposition for the private owner. It must be remembered that the lumbermen have no investment in the actual growing of the present stand of timber now owned and being cut by them. To accurately determine the rate of growth a very large number of trees of each species must be measured. The diameters inside and outside the bark must be taken, the height measured and the age of the tree determined by ring counts. From these figures curves can be made that will show the average rate of growth for each species. It is obvious that the accuracy of these curves would depend upon the number of trees measured.

Owing to the lack of funds it was impossible to obtain sufficient data to construct any accurate curves, but a number of trees were measured in different localities to serve as an indication of the rate of growth of the present stands. It must be borne in mind that as trees of relatively small diameters only were taken, they were to some extent suppressed by the larger trees and their growth was much slower than it would be in cut-over land where the trees would receive full light. But the results obtained are sufficient to prove clearly that at least two things are necessary to make the growing of a second crop of timber an attractive business proposition.

First—The present method of taxation must be changed in such a way that the private owner can afford to hold the cut-over land for a term of years without financial returns.

Second—The reproduction on the cut-over lands must be effectively protected from fire in order to produce a future crop that will pay returns to the investor.

WEED LUMBER COMPANY.

The Weed Lumber Company owns 71,460 acres of forest land in Siskiyou County. Of this, 20,000 acres have already been cut over. The mills and factories are located at Weed, and the logs are hauled in from the camps by the California and Northeastern branch of the Southern Pacific Railroad. These camps are located from 25 to 45 miles northeast of Weed.

The elevation of the holdings ranges from 3,500 feet at Weed to 6,000 feet in the vicinity of Camp 1. For the most part the slopes are very gentle, and at the three main camps the logging is done with Michigan wheels. Camp 4 is the only camp where the land is being logged with donkeys. It is located on a small creek and the slopes are steep. The area logged with donkeys is relatively small, as only about 700,000 feet is cut per month, while the total cut from the four camps averages about 10.000,000 feet per month.

Type.

The pure yellow pine type prevails throughout the holdings. Incense cedar (*Libocedrus decurrens*) is found to a small extent in association with the yellow pine. Along the streams and on the flats near the streams Douglas fir (*Pseudotsuga taxifolia*) and white fir (*Abies concolor*) enter into the type in association with the yellow pine.

The stand as a whole is open and park-like, and the trees are short, with considerable taper, and do not clear themselves well. The stand will average from about 15,000 to 20,000 board feet per acre.

Fire.

No serious fires have occurred in this locality in recent years. A few small fires have been set by the donkey engines, but they have been extinguished before any damage was done. In earlier times practically the entire area was swept by two serious fires, one of which occurred thirty-eight or forty years ago and the other from sixty to sixty-two years ago. Nearly all of the mature trees are more or less scarred at the base as a result of these fires, and in many cases the fire scar is so deep that the lower section of the tree cannot be used. Many trees were entirely killed.

There are several reasons why there have been no bad fires of recent years. One is the open character of the timber, which makes fire easy to control. Another is that the company has adopted the policy of piling and burning its slash, this greatly reducing the fire danger. Unburned slash left scattered over the ground constitutes a very grave fire menace to the remaining trees and to the nearby uncut areas, but the danger of fire on cut-over land is reduced to a negligible quantity where the slash has been carefully piled and burned.

Still another reason for the absence of serious fires is the fact that the company is very careful. All fires are extinguished as soon as discovered, irrespective of their size or whether they appear dangerous.

A fairly good system of protection against fire has been adopted. The logging engines burn oil and the donkey engines are equipped with spark arresters. In addition to these spark arresters, an assortment of shovels and axes are always kept near the donkeys, and if by some accident a fire is set, it is promptly extinguished. The superintendent of the woods and the steward of the camps are constantly riding between camps and report any fires they may discover. The company's cruisers may also be classed as fire guards, because their work carries them throughout the entire holdings. The superintendent of the woods and one of the cruisers are state firewardens, having authority to call out the men at any time to fight fire.

A very complete system of fire protection has been established by the company for its mills and factories at Weed. The roofs of the buildings are equipped with sprinklers, and the interiors are equipped with the automatic sprinkling system. Two wire screens act as spark arresters on the burner. Fire hydrants are stationed at intervals throughout the grounds and a complete system of alarms has been arranged. A watch tower, equipped with telephone and a searchlight, has also been built on a nearby hill in order to observe fires at night.

Although the protection system in the woods is fairly good, it should be made more complete. This could be done very easily with only a relatively small outlay. The slash should be more carefully and more completely burned. Two men whose duties should be purely patrol and extinguishing fires should be hired by the company during the dry season. Conscientious men could be secured for about $50 each per month and expenses. Since the company maintains a store and keeps a great number of horses, their food could be secured at wholesale prices, and horses could be kept very cheaply. The total cost to the company should not exceed $160 per month. The dangerous season in this locality covers only from three to four months, making the total cost per annum not more than $640, or approximately nine tenths of 1 cent per acre. With such a system the company would be insured against a repetition of the fire which occurred about forty years ago, completely destroying hundreds of thousands of feet of timber and killing countless numbers of young trees, which to-day would have been ready for the market.

Forest Cover.

The forest cover found on the holdings of this company comprise the following species:

Manzanita, buckthorn, sagebrush, mountain mahogany, willow, deer brush, gooseberry, wild rose, Oregon grape, alder, aspen, and squaw-carpet.

Buckthorn was found only in the old cut-over land near Weed. Manzanita was found scattered over most of the area, but only in a few places did it make a dense growth. Except in the few areas where the chaparral growth was exceptionally dense, reproduction was not retarded to any marked extent. Sagebrush was found only in the extremely dry situations. Willow, aspen, and cottonwood were found in dense thickets along the banks of Antelope and Butte creeks. The wild rose and gooseberry were also found in the moister situations. Mountain mahogany was found more frequently on the dry slopes and benches.

Ground Cover.

The ground cover is fairly good in both the virgin and the uncut areas. In the virgin stand it consists mostly of a layer of needles and squaw-carpet varying from one to four inches in thickness. It is decomposing well, especially in the moister situations, making a very good seed bed. The ground cover was found to be best in the moist flats along the streams.

In the cut-over land, except in that portion which has been logged with donkeys, there is sufficient ground cover to make a good seed bed.

Logging.

Yellow pine forms almost the entire cut made by the company. This is not due to discrimination against other species, but to the fact that yellow pine occurs in pure or nearly pure stands in this locality. Douglas fir, incense cedar and white fir are cut when good trees are found, but they make up only a small per cent of the total cut.

An approximate minimum diameter limit of about twelve inches has been established by this company for all species. Some parts of the area have been cut over a second time for ties, and trees have been taken to a minimum diameter of about 8 inches. On an average from three to five trees of 12 inches or over in diameter have been left to the acre on the cut-over area. Many of the trees are poorly formed, but on the whole little damage was sustained by them when the area was logged. A great deal of damage, however, was done to trees under four inches in diameter. Very little attention was paid to the reproduction in felling and many trees were felled in and skidded over thick clumps of young seedlings, destroying a large percentage of them.

With a little care, the method of logging pursued by this company should do little or no damage to the trees left standing. The trees are felled by a crew of two men. After being bucked into logs, they are bunched in groups of from one to six logs, depending on their size. These bunches are hauled over skid roads to the landing by Michigan wheels. At the landing they are loaded onto the cars by a steam loader, and from here they are hauled to the main line of the California and Northeastern railroad by the logging engine.

The next crop on the cut-over area will undoubtedly be chiefly yellow pine, notwithstanding the fact that too few seed trees have been left. This is due to the fact that the virgin stand was composed of nearly pure yellow pine, and it is the only species near enough to re-seed the area.

The company should pay more attention to the reproduction when felling the trees and skidding the logs. A little care along this line would incur no expense and would leave the area in good shape to produce a second crop which in time would equal the virgin stand. More seed trees should also be left to re-seed the areas where there is no reproduction at present.

Waste in Logging.

The company is pursuing a policy of close utilization and comparatively little is being wasted. The tops are being taken to a small diameter and used in the company's box factory.

In general, the chief waste is in the high stumps and in the broken tops. The average height of the stumps in the recent cuttings made by this company is about 2.7 feet. There is no reason why this should not be reduced to a height of one foot. It has been demonstrated on government sales that this is entirely practicable and that the sawyers soon become accustomed to sawing in the new position. At first glance this waste may seem insignificant, but it may be easily demonstrated that it soon runs into the thousands of board feet.

The accompanying table represents a total of one acre of the recent cuttings on this tract. Thirty-one trees were cut from this acre. If the stumps had been cut to a height of twelve inches, the volume saved on this one acre would have been as follows:

TABLE NO. 1.

Stump.	Diameter at top in inches.	Total height in feet.	Height above one foot.	Volume saved cubic feet.
1	29	2.5	1.5	6.9
2	16	2.3	1.3	1.8
3	26	2.5	1.5	5.5
4	31	2.8	1.8	9.5
5	29	2.6	1.6	7.3
6	26	2.6	1.6	5.9
7	28	2.7	1.7	7.3
8	31	2.7	1.7	9.0
9	24	2.7	1.7	5.3
10	30	3.0	2.0	9.8
11	32	2.7	1.7	9.6
12	37	3.0	2.0	15.1
13	23	2.7	1.7	4.9
14	26	2.9	1.9	7.0
15	34	3.0	2.0	12.9
16	31	2.8	1.8	9.5
17	34	2.9	1.9	12.2
18	22	2.9	1.9	5.0
19	22	3.0	2.0	5.2
20	20	2.9	1.9	4.1
21	24	2.8	1.8	5.7
22	23	3.1	2.1	6.1
23	19	3.1	2.1	4.1
24	19	2.9	1.9	3.7
25	26	3.0	2.0	7.4
26	36	3.1	2.1	15.1
27	30	3.0	2.0	9.8
28	29	2.7	1.7	7.8
29	41	2.6	1.6	14.7
30	35	3.0	2.0	13.6
31	28	2.6	1.6	6.8
Total volume saved (cubic feet)				248.6

Thus 248.6 cubic feet or approximately 1,492 board feet would have been saved on one acre by cutting to this lower height. On one section, which represents about one month's cut by this company, the total unnecessary waste from high stumps was 640 times 1,492 board feet, or 954,880 board feet.

The broken tops were caused largely by carelessness in felling and much of this waste could easily be remedied.

That the waste in logging may be shown more clearly, sample plots of one fourth acre were chosen on areas representative of average conditions. The diameter and height of each stump were measured and tabulated by species. Unused tops were calipered at the butt, and their total lengths were measured in addition to the possible merchantable length to a point six inches in diameter.

The following table shows the result of such measurements for each plot:

TABLE No. 2.

WASTE IN LOGGING.

Plot No. 1. ¼ acre. (Camp 2.)

Stumps.			Unused tops.		Unused merchantable section.		Trees 6 inches and over in diameter left standing.		Condition.
Species.	Diameter outside bark (inches).	Height (feet).	Total length of top (feet).	Diameter outside bark at butt end (inches).	Length to 6 inch diameter (feet).	Diameter outside bark at butt end (inches).	Species.	Diameter breast high (inches).	
Yellow pine	29	2.5	26.0	14	Top forked	and crooked.	Yellow pine	13	Alive and healthy.
Yellow pine	16	2.3	15.0	9	8	9			
Yellow pine	26	2.5	25.5	13	6	13			
Yellow pine	31	2.8	42.6	28	Top very pu	nky at heart	—spike top.		
Yellow pine	29	2.6	24.6	13	Top crooked	—no value.			
Yellow pine	26	2.6	19.0	13	6	13			
Yellow pine	28	2.7	20.0	9	Top crooked	and forked.			

Plot No. 2. ¼ acre. (Camp 3.)

Stumps.			Unused tops.		Unused merchantable section.		Trees 6 inches and over in diameter left standing.		Condition.
Species.	Diameter outside bark (inches).	Height (feet).	Total length of top (feet).	Diameter outside bark at butt end (inches).	Length to 6 inch diameter (feet).	Diameter outside bark at butt end (inches).	Species.	Diameter breast high (inches).	
Yellow pine	31	2.7	20.0	14	Top crooked	—no value.	Yellow pine	11	Alive and healthy.
Yellow pine	24	2.7	26.0	14	4	14	Yellow pine	17	Alive; forked; no value.
Yellow pine	30	3.0	19.5	16	Top crooked	and broken.			
Yellow pine	32	2.7	27.5	14	Top crooked	and broken.			
Yellow pine	37	3.0	31.0	17	Top smashe	d.			
Yellow pine	23	2.7	Broken.	11	Beyond mea	suring.			
Yellow pine	26	2.9	Top sma	shed; im	possible to m	easure.			
Yellow pine	34	3.0	36.0	12	Top broken.				
Yellow pine	31	2.8	21.5	11	Top too sma	ll and limby.			
Yellow pine	34	2.9	24.0	10	Of no value.				

Plot No. 3. ¼ acre. (Camp 3.)

Yellow pine	22	2.9	20.0	14	Top smashed.		Yellow pine	16	Alive; scraggy top.
Yellow pine	22	3.0	17.0	13	12	13	Yellow pine	16	Alive; scraggy top.
Yellow pine	20	2.9	Top burned; impossible to measure.				Yellow pine	11	Alive; not healthy.
Yellow pine	24	2.8	28.0	8	Top too small to measure		Yellow pine	12	Alive; fair condition.
Yellow pine	23	3.1	26.0	12	*6	12	Yellow pine	14	Alive; fair condition.
Yellow pine	19	3.1	25.0	13	6	13	Yellow pine	11	Dead.
Yellow pine	19	2.9	25.3	10	12	10	Yellow pine	6	Dead.
Yellow pine	26	3.0	18.0	8	Top crooked—no value.		Yellow pine	7	Alive; suppressed.
							Yellow pine	4	Dead.
							Yellow pine	13	Alive; healthy.

*Spike top.

Plot No. 4. ¼ acre. (Camp 4.)

Yellow pine	36	3.1	39.0	13	Broken by felling.		Yellow pine	14	Alive, healthy, but bruised by cable.
Yellow pine	30	3.0	33.0	14	Broken.*		Yellow pine	14	A stub, broken off by logging.
Yellow pine	29	2.7	Top badly broken—impossible to measure.						
Yellow pine	41	2.6	29.2	11	Too small.				
Yellow pine	35	3.0	36.0	18	Limby; 12-ft. log could have been taken.				
Yellow pine	28	2.6	38.0	13	Broken by felling.				

*Broken 2 feet above last cut; rest of top too small.

Disposal of Slash.

No disposal was made of slashings on the old cut-over lands. Tops were left on the ground with branches unlopped, forming a constant invitation to destructive fires. Fortunately, no bad fires broke out, and the slash is now in an advanced stage of decomposition and may not be considered a serious menace.

In recent years the company has adopted the policy of piling and burning their slash every fall. The disposal is not complete as the branches are not lopped and the débris is only partially piled, but the fire danger is greatly lessened. No attention is paid to reproduction when piling and a vast amount of damage is done. Sometimes the slash is piled in the open; sometimes up against such trees as are left, and often times in thick clumps of reproduction which are entirely destroyed when the piles are burned. Such damage is unnecessary and should be avoided. Slash should be piled away from reproduction and burned clean.

Insects.

Trees in this locality have not been greatly damaged by insects. A few young yellow pine were found to be infected with a specie of scale but none were found on mature trees. The scale was nowhere found in great numbers and the damage was not noticeable. The pine beetle was also noticed in this locality.

Second Growth.

The species comprising the second growth are yellow pine, incense cedar, Douglas fir, and white fir. Yellow pine occurs in nearly pure stands in the dry situations. Incense cedar enters into these stands to some extent. Douglas fir and white fir occur in association with yellow pine near streams and wherever there is considerable soil moisture.

As a whole, the ground cover is very fair. A good layer of humus has been formed by pine needles and herbaceous plants on all but the driest situations. Moisture conditions are poor in most of the tract, but there appears to be enough soil moisture present to support a fair stand of yellow pine.

Considerable chaparral has come up in the old cuttings, but the growth is seldom dense. It has served more as an usher growth and has not greatly retarded reproduction. In some localities, where no seed trees have been left, chaparral has taken complete possession. It will be necessary to seed these areas to produce a second crop that will pay to cut.

In general, the reproduction is as good as could be expected under a clear cutting system, and the indications are that if fire is kept out, a scattered stand of nearly pure yellow pine will mature.

Recently Cut-over Land.

Reproduction on recently cut-over land is not nearly what it should be to produce a normal stand. Too few seed trees have been left to reseed the barren areas. Young growth in the virgin stand occurs mostly in patches, but would produce a fair second crop if sufficient care was used in logging to save it.

But, under present conditions, most of this growth is destroyed. Trees are felled in and logs are skidded over dense clumps of young yellow pine. This damage is greatest in areas logged with donkey engines. By far the greatest per cent of damage to reproduction, however, is done in careless piling and burning of slash. At least 75 per cent of all young growth in the virgin stand is destroyed during logging operations. The remainder is not enough to produce as good a future stand as the soil is capable of yielding.

Reproduction.

So far, no attempt has been made to replant natural openings occurring in the woods. In many places this practice is essential that a fully stocked stand may be secured. Excessive light admitted to such areas after logging is unfavorable to natural reproduction. Chaparral species occur in varying numbers and their growth is greatly accelerated after logging because of additional light. A proper control of the amount of light admitted to any area is more important than any other factor in regulating the number and kind of species destined to predominate in the future crop.

Too close logging may not only afford the cut-over area or germination bed too much light for the natural propagation of trees, best suited for commercial purposes, but may remove all of the seed-bearing trees and thereby prevent natural re-stocking until the smaller trees bear fruit.

On the whole, the area under consideration is re-stocking quite well. Some planting or seeding will be necessary on frequent openings remote from seed trees. Since most of the seed-bearing trees are removed, intensive patrol is of the utmost importance during the dry, hot summer months, for areas burned over after logging can no longer be restocked by natural seeding.

To show more clearly the result of lumbering, sample plots one-quarter acre each were laid out on representative cut-over areas. The height and diameter of each stump were measured. These measurements give a clear picture of the number, size, and kinds of trees removed. All remaining trees over one inch in diameter were calipered and recorded by species and diameter classes; and those under one foot in height and one to six feet in height were measured and classified.

PLATE V. Proper disposal of slash.

The slash on this area has been piled and burned, and the land is now in good condition to produce another crop of trees. The fire danger to reproduction is reduced to a minimum. A surface fire, should one occur, could easily be extinguished. Disposal of slash is an important procedure in the protection of cut-over lands.

The following table gives the result of the measurements taken in tabular form. Special attention is directed to the lack of trees of sufficient size to produce seed:

TABLE No. 3.

REPRODUCTION ON RECENTLY CUT-OVER LAND.

Plot No. 1. (Camp 4.)

Stumps.			Species over 1 inch in diameter.					Seedlings.						Remarks.
								1 to 6 feet in height.				Under 1 ft. high.		
									Species.					
Species.	Height (feet).	Diameter outside bark (inches).	Diameter breast high (inches).	Sugar pine.	Yellow pine.	White fir.	Cedar.	Height (feet).	Yellow pine.	White fir.	Cedar.	Species.	Number.	
Yellow pine	3.2	52	1		10	2	1	1	29	1		Yellow pine	30	This area is badly torn up; 20% of the seedlings are O. K. while the rest are badly damaged and beyond a chance of surviving.
Yellow pine	2.8	24	2				1	2	44	2		White fir		
Yellow pine	2.5	31						3	19			Cedar		
Yellow pine	3.0	32						4	9					
Yellow pine	3.2	37						5	1					
Yellow pine	2.0	30												
Yellow pine	3.5	32												

Plot No. 2. (Camp 4.)

Species.	Height (feet).	Diameter outside bark (inches).	Diameter breast high (inches).	Sugar pine.	Yellow pine.	White fir.	Cedar.	Height (feet).	Yellow pine.	White fir.	Cedar.	Species.	Number.	Remarks.
Yellow pine	2.6	32	1		19	2		1	1			Yellow pine	1	
Yellow pine	2.5	20	2	1	3			2	4					
Yellow pine	2.8	22						3	13					
Yellow pine	2.4	30						4	2					
Yellow pine	2.8	26												

Plot No. 1. (Camp 3.)

Species.	Height (feet).	Diameter outside bark (inches).	Diameter breast high (inches).	Sugar pine.	Yellow pine.	White fir.	Cedar.	Height (feet).	Yellow pine.	White fir.	Cedar.	Species.	Number.	Remarks.
Yellow pine	3.1	24	6		1			1	16			Yellow pine	19	Good grazing over entire area.
Yellow pine	2.8	18	12		1			2	11					
Yellow pine	3.0	28	13		1			3	3					
Yellow pine	3.0	31	14				1	4	1					
Yellow pine	2.9	23												
Yellow pine	2.6	23												

Plot No. 2. (Camp 3.)

Yellow pine	3.1	38	1		6			1	12			Yellow pine	7
Yellow pine	3.0	31	2		7			2	7				
Yellow pine	2.9	19	4		2			3	1				
Yellow pine	3.1	24	5		2								
Yellow pine	3.1	26	6		1								
Yellow pine	3.1	25	10		2								
			11		1								
			12		2								
			16		1								

Plot No. 1. (Camp 2.)

Yellow pine	2.5	40	1		3			1	12			Yellow pine	25
Yellow pine	2.4	35	2		1			2	14				
Yellow pine	2.5	25	6		1			3	9				
Yellow pine	2.6	22	12		1			4	4				
Yellow pine	2.6	37	17		1								
Yellow pine	2.4	29											

Rate of Growth.

A thorough study of the rate of growth was not made. It is apparent from the measurements taken that yellow pine makes a good diameter growth during the first thirty or forty years. After that, the growth is slower. Thirty-five yellow pines of average growth were measured. They varied in diameter from 13.5 inches to 25.6 inches. The total height ranged from 55.6 feet to 103.5 feet and the age from 100 years to 207 years.

Conclusions.

The Weed Lumber Company is not practicing conservative forestry. No working plan for forest management has been prepared, and the annual cut is made without reference to the increment. The annual increment has not been ascertained nor has a financial rotation been established.

Logging is conducted without reference to the future or to the effect it has upon reproduction now on the area. Practically every tree of merchantable size on the logging area is felled and utilized. Comparatively speaking, close utilization is practiced. Stumps could be cut lower to advantage, and the bole, oftentimes, could be utilized to a smaller diameter in the top. Too few seed trees are left. Years must elapse before the areas first logged will have produced sufficient timber to afford a profitable second crop.

Slash on the older cuttings was not burned. In recent years, however, the tops and lops are burned every fall or spring. This practice lessens the fire risk, encourages the use of logged-off areas for grazing, and results generally in better forest conditions. More care should be exercised in piling brush to secure a cleaner burn and to protect reproduction, much of which is now unnecessarily destroyed during the burning operations. Brush piles should be made away from standing trees, and, so far as is practicable, placed in open places.

Areas that have little reproduction, after having been closely logged, should be planted or seeded before chaparral becomes firmly established. It can be held in check and eventually crowded out by the shade produced by young plants. On the whole, natural reproduction is good.

Every precaution is taken against the escape of fire in the woods, and prompt action is taken to extinguish those that do start. The woods superintendent, cruisers, and commissary clerk cover the territory between camps so frequently that they serve as patrolmen. Areas that are being logged are therefore well protected. Cut-over land, remote from the traveled trails and roads between camps, are unprotected and a fire once started could easily gain dangerous headway before the crews could be assembled and transported to the danger zone. For this reason two patrolmen should be employed during the fire season with no other duties. They should report in, daily, from designated stations, which should be connected by telephone with one of the camps.

McCLOUD RIVER LUMBER COMPANY.

In General.

The holdings of the McCloud River Lumber Company are situated northeast of the town of McCloud. The area comprises 232,063 acres, of which about 71,000 acres are cut-over and 161,063 acres are virgin. The country is rough and mountainous in a large part of the tract, but opens out into rolling ridges and flats where logging conditions are almost ideal.

Fire.

Serious fires occurred on this area approximately fourteen, thirty-seven and forty-five years ago, as evidenced by ring counts on the fire-scarred stumps. These fires burned over large areas between McCloud and the present camps on which chaparral has now taken possession.

There have been no bad fires in recent years for the reason that the company has adopted a fairly efficient system of fire protection. All logging engines are equipped with spark arresters. Two firewardens with salaries of $75.00 per month and horse feed, are hired. Their duties consist of patrol work during the fire season and taking charge of the brush burning in the spring and fall. They report each week to the superintendent of the company and have orders to call out a whole camp if necessary to extinguish a forest fire. All campers and hunters on the company's holdings must obtain a permit from the office, and each firewarden must report the campers when they arrive in his territory. The company has had seven of its employees appointed state firewardens.

At the donkey camp, two night watchmen are employed to watch for fire. One patrols the camp and the other watches the donkeys. If fire is discovered, the watchman reports to the camp foreman immediately and the crew is at once called out to extinguish it. All employees, including the railroad crews, have orders to stop work and extinguish fires. The section crews are required to keep the old rotted ties and rubbish along the right of way burned up. Water barrels have been placed at intervals on all trestles. The company's warehouses at Bartol have water barrels on the roofs and a fire hydrant with a real fire hose is located near them. At the mill and around the company's administrative buildings in McCloud are located hydrants with reels of fire hose placed conveniently close together. The interior of the buildings have been equipped with automatic sprinkling systems.

Forest Cover.

Dense stands of chaparral have taken possession of most of the old cut-over lands. Even where recent fires have burned off the forest cover, the chaparral is rapidly sprouting and will undoubtedly again take possession of most of the area. On the areas of the oldest fires, most of the seedlings have outstripped the forest cover and will eventually regain possession. The species forming the forest cover on the old cut-over lands are manzanita, buckthorn, ceanothus, black oak, willow and cherry. Additional species, such as dogwood, aspen, alder and wild rose, are found on the recently cut-over lands, where enough white fir has been left to produce a partial shade. These latter species also occur as an undergrowth throughout the virgin stand. The manzanita, ceanothus, buckthorn, wild rose and black oak grow on the drier locations while the willow, dogwood, alder, and cherry seek the more moist situations.

Ground Cover.

The ground cover on the old cut-over lands is very thin, consisting of squaw-carpet, thimbleberry, ferns and a thin layer of pine needles and chaparral leaves. Ferns and thimbleberries are found only where the moisture conditions are good. On the more recently cut-over lands, grasses, ferns, thimbleberries and other herbaceous plants grow in abundance, and a thick layer of duff, humus, needles and leaves is found everywhere except on small burned areas. The ground cover is decomposing most rapidly in the moderately moist situations and is making a good germinating bed for seeds.

Logging.

Very little damage is done to the reproduction by the logging operations. A diameter limit of 18 inches on the stump has been established for all species. This limit is sufficient in this locality to leave plenty of seed trees to restock the cut-over areas. Fine, thrifty yellow and sugar pines up to 18 inches in diameter were noted on the recently cut-over lands. Only sugar and yellow pine are being cut for the market. Fir is taken only for a specified order or when it has to be cut on the right of ways or for the company's own construction use or for fuel.

Stands that run heavy with firs, even though there are scattering pines in mixture, are left with the hopes that a future market can be found so that all the mature timber of all species can be cut to advantage. Some of the most accessible pine is taken from these stands, but the remaining areas appear almost virgin.

Trees are used down to a top diameter of 8 inches to 12 inches according to the character of the top. Stumps are cut to an average height of 2.8 feet. Timber, broken in felling, is used in odd lengths down to a minimum of 8 feet. If the company continues to discriminate against white fir, it will undoubtedly be the predominating specie in the next stand because of the numerous mature seed trees left, with their prolific seed-bearing power and the high percentage of germination of the seeds. More fir should be cut in order to check its rapid re-seeding of areas suitable for the reproduction of the more valuable pines.

Waste in Logging.

This company is pursuing the policy of fairly close utilization of its timber. All trees smashed in felling are taken down to a length of 8 feet. The stumps average 2.8 feet in height. In only a few instances have tops been left that might have been utilized had they been taken at the time of logging. The reason for the small waste is that the company owns a well equipped box factory at McCloud and the odd lengths can be profitably utilized. Instances were noted where doty and wind shaken logs, containing barely enough lumber to pay for the cutting and handling, were taken.

Disposal of Slash.

Slash is partially piled either in windrows or piles during the logging operations. Soon after the first rains in the fall and before the last rains in the spring, the two company firewardens take charge of the brush-burning crews. The slash, as it is lopped, is thrown out of the way of the skidders, sometimes on young reproduction, sometimes on top of the chaparral and sometimes in the open. The brush burning is not thoroughly done for the reason that the tops are not lopped enough to aid the fire in consuming the larger branches. However, the needles and small branches are consumed and the greater part of the fire danger removed. The slash should be piled away from the reproduction, for a large per cent of the growth is destroyed by the present system.

In the old cuttings, which have not been burned over, the slash has dropped its leaves and is slowly decomposing. It does not constitute a serious menace, but would make ready fuel in case of a ground fire.

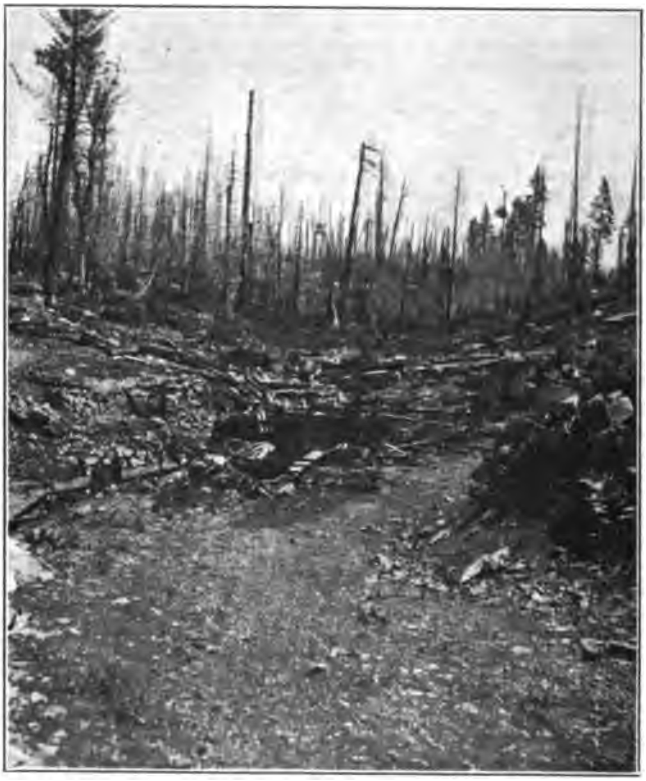

PLATE VI. Destruction by fire.

Results of a ground fire in Shasta County that burned over four sections of cut-over land and destroyed a portable sawmill, the ruins of which are shown in the picture. All tree growth in the path of the fire was destroyed. Chaparral is already taking possession of the area. Sparks from a donkey engine started this fire. Had there been an efficient system of fire protection, the fire would never have reached the mill.

Diseases.

Fungi is working in the heartwood of the sugar and yellow pines and doing considerable damage. A grayish white growth forming in the tops of the sugar pines indicate that it is sapping its nourishment from the host and slowly destroying the heartwood. A growth of 6 inches in diameter and 15 inches in length will destroy from 6 to 8 feet of the trunk. Heart-rot runs badly in sugar pine when punky holes, left by drying branches, are found on the exterior. Considerable heart-rot is also found in yellow pine, but they run more sound than the sugar pine. The incense cedar runs very doty with dry rot, especially when mature.

Rate of Growth.

A detailed study of the rate of growth of the several species was not made. Fifteen yellow pine trees were carefully measured to give an idea of the number of years required to attain their diameter and height growth. Diameter measurements were taken at a point 4.5 feet from the ground. These trees varied from 12 inches to 23.6 inches in diameter and are from 38 to 177 years old. Their total height ranges from 50.8 feet to 167.4 feet.

Conclusions.

The McCloud River Lumber Company is not practicing conservative forestry because the annual cut is made without reference to the yield. No rotation of crops has been established. Future yield is being left to chance.

An approximate diameter limit of 18 inches has been established for such species as are harvested. This practice offers some assurance for natural reproduction but will not secure a fully stocked stand on cut-over areas. But little white fir is being removed, so this species will form a larger percentage in the next crop and to the exclusion of the more profitable ones. Close utilization of felled timber prevails.

A fairly good fire protective system is in force. Mounted patrolmen ride continually during the dry season; woods foremen and train crews are instructed to respond promptly to fire calls; and a hunting and camping permit system is in force.

Tops and lops resulting from logging are burned under favorable conditions. Not enough attention is given to reproduction during the burning operations. Brush piles should be made as far from seedlings as possible. Tops should be lopped closer to insure a cleaner burn.

CASTLE CREEK WATERSHED.

In General.

Castle Creek empties into the Sacramento River in section 22, township 38 north, range 4 west, about one half mile north of Castella, Shasta County, About 30,000 acres, which are located in township 38 north, range 4 west, township 39 north, range 4 west, township 38 north, range 5 west, and township 39 north, range 4 west, about one half mile north of Castella, Shasta County. ranges from 2,000 feet at the junction of the stream with the Sacramento River to about 4,000 feet at its source. The slopes, varying from gentle to very steep, come down almost to the bed of the creek, but near the mouth, the canyon widens out until it is nearly a fourth of a mile in width.

Fire.

Old fires have swept over this watershed, completely killing large areas of timber and doing great damage to many other areas where the trees were not entirely killed. Chaparral has taken complete possession of many of these burned over slopes. Almost every mature tree on this watershed is more or less scarred and charred stubs are scattered throughout the entire area. It is impossible to determine the exact dates of these fires, but the indications are that there were at least three, which occurred at intervals of approximately fifty years.

There have been no bad fires on this watershed during the last ten or twelve years. This is due to the fact that a part of the basin has been included in the Shasta National Forest and in consequence the entire area has been protected.

Aside from the Government patrol, very little is being done on this watershed in the way of protection. The M. A. Burns Lumber Company is operating in this basin, but they are doing little or nothing to protect their timber. Their engines are not equipped with spark arresters, no patrol has been instituted on their lands, and their slash, which is unburned, is a serious menace.

They do not coöperate with the Government, except in so far as is specified in their contracts purchasing government timber, but they are endeavoring to be reasonably careful about starting fires and put out any fire they may discover on their own land.

The company should be required to equip all of their engines with spark arresters, and to burn their slash each year. Under the present conditions it would be almost impossible to extinguish a fire in the cut-over lands. It would not be necessary for them to institute any system of patrol for the area owned by them is comparatively small, and the government rangers patrol the entire watershed. They could easily notify the company in case a fire breaks out on their own land.

Reproduction.

In the areas where there have been no recent fires, the reproduction is fairly good in both the virgin and the cut-over lands and consists mainly of yellow pine, Douglas fir and incense cedar. Sufficient seed trees to produce a future crop have been left in the cut-over land belonging to the government and the reproduction is fairly good. The privately owned cut-over land has been logged too close. Insufficient seed trees have been left, and chaparral is gaining possession of the logged-off area. However, if fires are prevented a light unmerchantable stand can be secured. The danger of fire to the young growth on the private land is much greater than to that on the government land, because of the slash which has been left unlopped and unburned on the ground. There is little or no reproduction on the burned-over areas. No seed trees were left alive to re-seed the ground and the present chaparral growth is very dense. It would be necessary to seed these areas artificially to produce a future stand of timber.

Forest Cover.

The chaparral species noted on this watershed were willow, alder, cañon live oak, California oak, maple, manzanita, buckthorn, flowering dogwood, California redbud, chinquapin, rose, lilac, thimbleberry, Oregon grape, and squaw-carpet.

Dense thickets of willow and alder grow along the banks of the creek. The oaks and maples were found on a variety of soils, ranging from moist to very dry, but were noted in greatest abundance below 2,500 feet in elevation. The manzanita and buckthorn were found on the dry slopes and in dense growth throughout the old burns. There is considerable forest cover throughout the entire watershed, but it does not appear to retard reproduction on the cut-over land where sufficient seed trees have been left. In some parts of the virgin stand the forest cover is dense enough to hinder reproduction, but these areas are small. There is little or no reproduction in the dense thickets of manzanita and buckthorn found on the steeper slopes. However, these chaparral areas act as a substitute for the trees in conserving the moisture and preventing erosion on the watershed.

Logging.

Approximately, 3,000 acres have been cut-over on this watershed. Of this, about 1,500 acres were on government land and the remainder on privately owned land. The logs were hauled down dry chutes to the logging railroad with donkey engines.

Cut-over land belonging to the government presents a great contrast to the privately owned land. On the former, the effect of logging has been merely to thin out the stand and make way for a good future crop. A diameter limit of approximately eighteen inches was established, and a sufficient number of thrifty seed trees of the most desirable species were left to produce another crop of timber. On the privately owned land, however, the area has been completely skinned. Everything from which a log could be secured, was cut, and there are far too few seed trees left to re-seed the area. A large per cent of the privately cut-over land is already in possession of chaparral and would undoubtedly need artificial seeding to produce a future stand of timber that would pay to cut.

Waste in Logging.

A policy of very close utilization has been followed on all the government land. The stumps were cut down to a height of from 1.5 to 2 feet and the tops were taken up to a very small diameter. On the private land, the unnecessary waste has been great. The stumps were found to range from 3 to 5 feet in height and long unused tops were left, from which another log could easily have been taken. Many trees also were broken by careless felling and a number of logs of merchantable diameters were left in the woods.

Disposal of Slash.

All the slash has been burned on the cut-over land owned by the government. The branches were lopped from the tops and the slash was piled away from the young growth so that very little damage was done to it when the piles were burned in the fall. The contrast between the condition of the slash on the government land and that on the privately owned land is so great that one can almost determine the exact boundaries between the two merely by looking at the slash. Nothing was done with it on the privately owned land. The tops were left on the ground with their branches unlopped and at the present time constitutes a grave fire menace to the reproduction. On the old cuttings, a part of it has been destroyed by fire and the remainder has decomposed to some extent. If fire is kept out for a few years more, the slash will probably decompose enough to greatly reduce the danger to the reproduction. But on the recent cuttings, the slash is so thick in many places that one cannot pass over the area without great difficulty.

PLATE VIII. Result of repeated fires.

A once thickly timbered area now covered with a dense growth of chaparral as a result of repeated fires. There are approximately 5,000,000 acres of chaparral land in California, which were once covered with timber. Repeated fires have killed the trees and given the chaparral possession. Burned timber pays no wages and turns away labor empty-handed. Taxes on other forms of real estate are increased. An adequate protective system, maintained by the State, would prevent these disastrous fires.

Conclusions.

The deep slopes of the Castle Creek watershed need protection to prevent erosion and to conserve the water.

The M. A. Burns Lumber Company which is operating on this watershed, should coöperate with the government in protecting their lands from fire. Their engines should be equipped with spark arresters. The company should establish a larger diameter limit in order to leave sufficient seed trees to produce a good future stand.

The slash on the private lands should be piled away from the young growth and burned every fall after the first rains in order to reduce the fire danger to the reproduction. Unnecessary loss resulting from high stumps, unused tops, careless felling and logs left in the woods, should be discontinued.

LA MOINE LUMBER AND TRADING COMPANY.

In General.

The holdings of the La Moine Lumber and Trading Company are situated about seven miles west of La Moine, Shasta County, around the headwaters of Slate Creek, which is tributary to the Sacramento River. The tract comprises about 13,630 acres, of which 8,106 acres are cut-over and 5,524 acres are virgin. The elevation ranges from about 1,000 feet above sea level at La Moine to approximately 4,500 feet near the Trinity divide. The slopes are very steep and all logging is done with donkey engines.

The logs are hauled from the woods to the mill by a narrow-gauge railroad. All lengths are taken, but the 32-foot logs are used as much as possible to facilitate handling with the donkeys. The sawed lumber is sent by flume from the mill to the yards and factory at La Moine.

Fire.

Bad fires occurred in this locality approximately seventy-two, fifty-seven, forty, and twenty-two years ago, as evidenced by ring counts on the scarred stumps. The bareness of the area, the numerous charred stubs and the extensive chaparral areas prove that devastating fires have swept the area. There have been no serious fires, however, in recent years, due to the more careful handling of donkey engines, and the inclusion of the adjacent land within the Shasta National Forest, which is patroled during the dangerous season.

The company has a fairly good system of protection around its improved properties. Hydrants with reels of hose are scattered conveniently about the grounds of the box factory at La Moine and the buildings are equipped with an automatic nozzle system. The land around the mill was cleared as a protective measure, and hydrants, under pressure, have been installed at the mill. The donkey engines in the woods are equipped with spark arresters.

The company maintains no system of patrol on its holdings, and if their timber is to be protected from future fires, it will be necessary to establish some sort of patrol. The lands are so situated that one man could patrol such part of the holdings as to obtain a general view of all the rest of the area. This guard also could take charge of burning the slash and thus decrease the danger of destroying the virgin timber. A competent man for this work could be secured for about $50.00 per month and board, making the total cost to the company not more than $75.00 per month. In this region the dangerous season covers only about four months and the total cost of this protection would not exceed $300 or approximately 2 cents per acre.

Forest Cover.

Chaparral makes a rather dense growth in the virgin stand. Where the timber is thin, the brush has taken possession almost to the exclusion of all other growth. On the cut-over land, the chaparral is coming in rather slowly, but the indications are that it will claim most of the area, as there are far too few seed trees to give the reproduction a fair chance to get started. On the dry situations the following species were noted: Buckthorn, manzanita, ceanothus, rose, sadler oak, black oak, chinquapin, wild plum, lilac, and cherry. The following additional species were found in the more moist situations: California buckeye, dwarf maple, broadleaf maple, Oregon oak, California laurel, snowball, pepperwood, wild raspberry, elderberry, California redbud, Oregon grape, willow and dogwood.

Ground Cover.

The ground cover in the virgin forest is good, consisting of duff, humus, needles, ferns, squaw-carpet, and numerous herbaceous plants. Owing to the abundance of forest cover in the virgin stand, the ground cover is kept fairly moist and is decomposing well, making a suitable bed for germination. On the cut-over lands, the ground cover is scarce. Many places were noticed where the mineral soil was exposed. Over this area, it would probably be necessary to resort to planting to prevent the area from being claimed by chaparral.

Rate of Growth.

The number of trees measured are insufficient to indicate accurately the rate of growth in table form, and the following data obtained by measuring twelve yellow pine, five white fir, two Douglas fir and three sugar pine, all of which were more or less suppressed, will serve only as an indication of the rate of growth on these holdings. Diameter measurements were taken at a point 4.5 feet from the ground.

Yellow pine attained diameters varying from 14.6 inches to 25.8 inches; ranged from 111 years to 177 years old, and in total height from 65.7 feet to 126.75 feet.

Sugar pine attained diameters varying from 16.6 inches to 18.2 inches; ranged from 152 years to 173 years old, and in total height from 74.9 feet to 88.5 feet.

White fir attained diameters varying from 15.8 inches to 19.7 inches; ranged from 100 years to 163 years old, and in total height from 73.4 to 97.7 feet.

Douglas fir atained diameters varying from 18 inches to 19.1 inches; ranged from 174 years to 217 years old, and in total height from 85.1 feet to 102.2 feet.

Logging.

The character of the ground on this area is such that only donkey logging is possible. This method necessitates a considerable amount of damage to the young growth, but this company is taking no care to avoid unnecessary injury. They are very careless in felling and skidding and many standing trees are smashed. Nearly all the seedlings are destroyed. An approximate diameter limit of fifteen inches on the stump has been established. Since there are few trees below this limit the system is one of clear cutting rather than of selection, and the cutting area thus becomes denuded. No attempt is made to protect reproduction.

The diameter limit must be increased to insure another crop. Natural restocking is practicable, so seed trees must be left. A large per cent of the damage to the young growth could be avoided with a little care, and the area would then be left in condition to produce a good future stand.

Waste in Logging.

Aside from the smashed tops, the unnecessary waste in logging is small. Odd lengths, down to eight feet are taken for the box factory and the tops are used down to a diameter of 10 to 12 inches. The stumps are cut low, averaging only about two feet in height.

The principal waste is in the smashed tops. Most of this is caused by carelessness in felling and could easily be avoided. At present, many of the trees are felled down hill and often slide 50 to 100 feet, breaking the top so that, at least, one log is wasted.

Disposal of Slash.

In the old cut-over land, the slash that has not been destroyed by accidental fires is decomposed and does not constitute a serious menace. No disposition is being made of recent slash. The tops are not lopped, and the débris is left scattered over the ground. On the recently cut-over land, this condition is a grave fire menace to the young growth. The menace is further increased bcause of the dense brush which adds greatly to the fury of a fire once started.

Conclusions.

This company does not apply correct forestry principles in the management of its timber lands. No rotation has been established; the annual cut is made without reference to the annual increment; logging is conducted without reference to the future; and no policy has been adopted for the protection, management and reforesting of its cut-over lands.

The diameter limit established removes practically all the merchantable timber and no seed trees are left to restock the logged-off areas.

So much timber has been removed that light conditions are unsuited to natural reproduction, and chaparral bids fair to take possession of the ground that once supported a profitable forest crop.

Unnecessary damage is done to trees left standing, and to seedlings and saplings which would otherwise mature and yield more timber in time to come.

Tops, lops and other refuse left after logging are not piled or burned. Slash left in this manner invites fire which, once started, is expensive to suppress and does untold damage to reproduction and to the watershed.

Land left in such a condition, when unsuited for agricultural purposes, is unproductive and increases the taxation on other forms of property. The assessed valuations, even on timber land, are far too low.

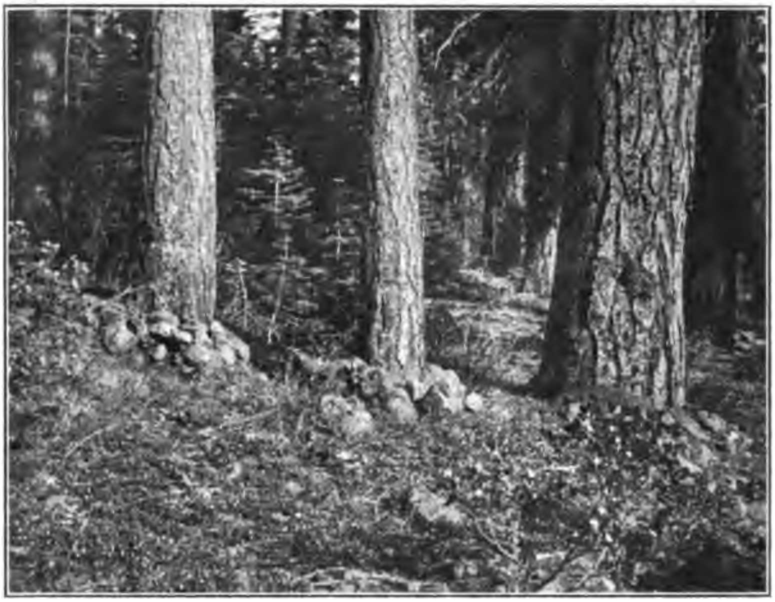

PLATE VIII. "Light Burning."

Some persons argue that forest fires can be prevented best by burning over forest areas periodically. The base of marketable trees are banked with dirt or rocks preparatory to burning. This practice is termed "light burning"—more properly "Piute Forestry." The forest floor, so necessary for the retention of water, is destroyed; seedlings and small trees are killed and the ground is unsuited for the germination of the seeds. The cost is prohibitive. It would cost about $9,000,000 to burn over our forested area once. Such a practice should be prohibited by law.

TERRY LUMBER COMPANY.

In General.

The Terry Lumber Company's holdings are situated about 35 miles northeast of Bella Vista, in the eastern half of Shasta County. They comprise 17,500 acres, of which 8,700 acres are virgin; 7,080 acres are cut-over and 1,720 acres are partly cut-over. The altitude of this tract varies from 2,800 to 5,500 feet above sea level. The mill is located at an elevation of about 4,200 feet. While logging was being carried on below this elevation a portable mill was operated and the rough lumber hauled to the flume by traction engines. The present logging camps are about four miles from the mill and the logs are hauled in by a narrow-guage railroad. The mill has a capacity of about 100,000 feet board measure daily, but during the season of 1911, cut only between 50,000 and 60,000 per day. From here, the rough lumber is flumed to the finishing mill at Bella Vista.

Fire.

The entire tract has, at some time, been burned over. Hardly a mature tree can be found that is not more or less scarred at the base. It was impossible to determine the exact dates of these fires, but it is evident that they occurred many years ago, for the fifty or sixty year old trees were not touched.

The only serious fire in recent years occurred in 1910. During this year numerous blazes were started by sparks from the logging engines. All but one was extinguished before any considerable damage was done. This fire was started by sparks from a donkey engine in section 2, township 34 north, range 1 east, and burned through sections 2, 11, 10 and 9 in the same township, completely destroying the portable mill in section 9. It was confined principally to the cut-over land, and, outside of destroying the mill, by far the largest amount of damage was done to the young growth. Everything in its path was killed and all the ground cover was destroyed, exposing the bare mineral soil in many places. Young growth is coming into this burned area very slowly, and as there are no seed trees left, it bids fair to eventually become covered with worthless chaparral.

Most of the cut-over land has been burned either at the time of logging or soon afterwards. Such fires are regarded by the company as being of little importance and no records are kept of them. That they were probably caused by indifference on the part of the company, in most cases, is shown by the absence of spark arresters on the engines and the fact that they occurred during or soon after the logging operations. Most of the young growth and such mature trees, as were left after logging, have been killed by these fires and a large part of the cut-over area is now in the possession of chaparral.

This company has no system of protection for its timber land. There are no spark arresters on any of the engines, and apparently little attention is paid to fires unless they threaten improved property. Some attempt has been made to protect the mill by means of hydrants about the grounds and barrels of water on the roof. The hoist at Camp No. 2 is also equipped with water barrels. If a fire is discovered at the start, this system of protection might be effective, but it would undoubtedly prove inadequate should the fire gain headway before being noticed.

Forest Cover.

The following species of chaparral were noted on this tract: Manzanita, buckthorn, wild lilac, deer brush, cascara, dwarf maple, alder, black oak, chinquapin, bitter cherry, western dogwood, gooseberry, wild rose, mountain willow, thimbleberry, redbud, Oregon grape, aspen and squaw-carpet.

Manzanita and buckthorn occurred mainly on the dry slopes and benches, and there was little or no reproduction on these areas. Lilac, deerbrush, cascara, maple, oak, chinquapin, gooseberry, rose, cherry, thimbleberry, redbud, and dogwood were found in a variety of soils, in situations ranging from moist to fairly dry. These species were not generally found in dense stands on this tract but were scattering and served as an usher growth for the seedlings. Alder, willow and aspen were found principally in the moist situations and along the streams.

Ground Cover.

The ground cover is good throughout most of the uncut area, consisting of a good layer of needles, a number of ferns, squaw-carpet, Oregon grape and thimbleberry. It is decomposing well making a good layer of humus. This is especially true of the more moist situations, where it makes a very suitable bed for germination.

On most of the cut-over land, especially that which has been cut in the last decade, fire has destroyed the ground cover, leaving a mineral soil exposed. Ferns and squaw-carpet are coming in the most rapidly on these areas, and there is also a thin layer of needles deposited by the dying trees.

Logging.

Because of the steep character of the country, the logging is done entirely with donkeys. The logs are hauled down dry chutes to the railroad. From here the loaded cars are drawn to the top of the ravine by means of a hoist and cable, and the logging engines take them from the hoist to the mill. The company is cutting entirely too close to provide for a second crop. Every tree from which a log can be secured is taken. Trees above 18 inches in diameter are cut for lumber; below 18 inches, they are cut mostly for ties. The stand remaining after logging is composed of scattered, unsound trees, with dead and dying tops.

No attention is paid to young growth when logging, and a large per cent of the seedlings are destroyed by careless felling of trees and skidding logs; but this damage is small compared with that done by the fire, which almost invariably follows logging on these holdings. All the remaining young growth is destroyed by this fire and the area left to become covered with chaparral.

If a second crop is to be secured on these lands, it will be necessary (1) to leave more seed trees, (2) to exercise more care in logging and (3) to protect the cut-over lands from fire.

Waste in Logging.

The chief wastes in logging noted were in high stumps and in broken tops. The stumps averaged about three feet in height, and could be cut to a height of 18 inches to two feet without additional expense.

Most of the broken tops were caused by carelessness in felling. Trees were often felled down the side of a steep hill and, as a result, the tops were badly smashed destroying, at least, one merchantable log.

Several sample plots were taken in different localities to show these conditions graphically. The following tables were made from the data secured on these plots:

WASTE IN LOGGING.

Plot No. 1.

¼-acre plots.

Stumps.			Unused tops.		Unused merchantable section.		Trees left, 6 inches in diameter and over.		Remarks.
Species.	Diameter outside bark, (inches).	Height. (feet).	Total length of top, (feet).	Diameter outside bark at butt, (inches).	Length to 6 inch top diameter, (feet).	Diameter outside bark at butt, (inches).	Species.	Diameter breast high, (inches).	
White fir	37	3.2	29.6	10	14.6	10	Cedar	22	Alive; uninjured.
White fir	32	3.1	33.5	13	21.0	13	Douglas fir	15	Alive; uninjured.
Sugar pine	46	3.0	26.3	14	15.0	14	White fir	23	Alive; uninjured.
Yellow pine	34	3.4	25.8	18	Broken; impossible to measure.		White fir	19	Alive; uninjured.
							White fir	12	Alive; uninjured.
							Douglas fir	20	Alive; top broken.

Plot No. 2.

Stumps.			Unused tops.		Unused merchantable section.		Trees left, 6 inches in diameter and over.		Remarks.
Species.	Diameter outside bark, (inches).	Height. (feet).	Total length of top, (feet).	Diameter outside bark at butt, (inches).	Length to 6 inch top diameter, (feet).	Diameter outside bark at butt, (inches).	Species.	Diameter breast high, (inches).	
Douglas fir	28	2.8	36.0	13	20.6	13	White fir	20	Dead.
Douglas fir	27	2.9	44.0	16	*29.0	16	White fir	26	Dead.
White fir	34	3.0	Smashed above 1 foot 9 inches in diameter by felling; impossible to measure.				White fir	9	Alive; suppressed.
Cedar	34	3.1	38.0	13	23.0	13			
Douglas fir	25	3.0	50.8	16	35.1	16			
White fir	24	2.7	39.1	13	22.7	13			

*Top broken.

Plot No. 3.

Yellow pine	36	3.1	Shattered.	23	30.9	Broken at 23	White fir	20	Alive; top broken.
White fir	40	3.0	38.5	18	21.5	13	Cedar	17	Alive; fire scarred; bad condition.
Yellow pine	37	2.9	45.6	25	37.6	Broken at 25	Yellow pine	19	Alive; poor top; bad timber.
Yellow pine	26	2.6	34.9	14	22.9	14	White fir	7	Alive; good condition.
Sugar pine	35	3.0	*35.0	26	Broken.†	26	White fir	9	Alive; good condition.
Sugar pine	41	3.3	45.0	19	32.5	Broken at 19	White fir	12	Alive; good condition.
White fir	26	2.8	57.9	17	43.9	17	White fir	11	Alive; good condition.
White fir	21	3.1	26.5	6	Used up to diameter.	6 inches top	White fir	9	Alive; good condition.
							White fir	6	Alive; good condition.

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*Heavy branches.

†Broken above 18 feet to 2-foot diameter.

Disposal of Slash.

No disposition is made of the slash. On the recently cut-over lands it constitutes a serious menace to the reproduction, and when fire comes in, as it most invariably has done on this tract, it will destroy all the young growth. If the branches were lopped from the tops and the débris piled and burned in the fall, ample protection would be afforded to reproduction since the ground cover is not thick enough to make a very hot fire.

Considering the area as a whole, the present fire menace from slash is not great, for the reason that most of the cut-over land was accidentally burned over at the time of logging or soon afterwards.

Second Growth.

On the area cut about 1892, before the present company assumed ownership, only the choicest and most accessible sugar and yellow pine was taken. This was due to the fact that the timber has to be freighted to Bella Vista, a distance of thirty miles, by teams, as the flume was not then built. So little has been taken out that the stand appears virgin to-day and a traction road is being built for the purpose of again logging it.

In examining the land cut over ten years ago (1902), a representative area of four acres was taken and only one small tree was found. Fire had swept the area and destroyed all the remaining young growth, and buckhorn, manzanita, deer-brush, and willow had taken possession. The soil and moisture conditions were good, but unless seeding or planting is resorted to, the area will remain in the possession of the chaparral. A few white and Douglas firs were noted in patches on this area, but they were far too few to reseed any great portion.

On the south half of section 1, township 34 north, range 1 east, the five-year old cut-over land was examined. They had cleared this area also. In only a few spots where fire had missed were any seedlings found. Sample areas taken in this cutting, would, in the majority of cases, show no reproduction. Ferns and salmon berry have come in thickly and chaparral is slowly gaining possession.

Sample plots were taken in the recently cut-over land that had not yet been touched by fire. The following tables were compiled from this data to show the actual amount of reproduction on this land. Each plot represents one fourth of an acre:

REPRODUCTION ON CUT-OVER LAND.

¼-acre plots.

Plot No. 1.

Stumps.			Species over 1 inch in diameter.				Seedlings.							Remarks.
							1 to 6 feet in height.					Under 1 ft. high.		
								Species.						
Species.	Diameter outside bark. (inches).	Height. (feet).	Diameter breast high. (inches).	Cedar. No.	White fir. No.	Yellow pine. No.	Height. (feet).	Sugar pine.	Yellow pine.	White fir.	Cedar.	Species.	Number.	
Douglas fir	46	3.5					1					Douglas fir	1	Area had been dragged over considerably by donkey engines.
Douglas fir	43	3.1	None. Chaparral coming in very thickly.				2			1		White fir	8	
Douglas fir	35	4.0					2.5			1				
Douglas fir	48	4.9					2.7			1				
Douglas fir	28	3.5					3.0							
Yellow pine	36	2.7					4.0			1				

Plot No. 2.

Species.	Diameter outside bark. (inches).	Height. (feet).	Diameter breast high. (inches).	Cedar. No.	White fir. No.	Yellow pine. No.	Height. (feet).	Sugar pine.	Yellow pine.	White fir.	Cedar.	Species.	Number.	Remarks.
Yellow pine	49	3.3	2		1		1	4	5	15	14	Sugar pine	39	Chaparral and squaw-carpet rapidly coming in on the area.
White fir	20	3.0	5		1		2	6	10	19	8	Yellow pine	33	
Cedar	20	3.0	6		1		3	4	10		2	Douglas fir	1	
White fir	29	3.1	10	1			4	1	7	1		White fir	51	
White fir	36	2.8	11	2			5			1		Cedar	40	
Douglas fir	52	3.5	22	1	Stub broken.		7			2				
White fir	31	3.0												

Plot No. 3.

Species.	Diameter outside bark. (inches).	Height. (feet).	Diameter breast high. (inches).	Cedar. No.	White fir. No.	Yellow pine. No.	Height. (feet).	Sugar pine.	Yellow pine.	White fir.	Cedar.	Species.	Number.	Remarks.
Douglas fir	42	3.8	2		2		1	2	1	8		Sugar pine	30	
Cedar	14	3.2	8			1	2	3		1		Yellow pine	4	
Cedar	17	3.6	11		Broken top 1		3	1				White fir	3	
Sugar pine	40	3.0	17		1		4	1				Cedar	17	
Cedar	13	2.6	19			1								
Yellow pine	24	2.8												
White fir	44	2.9												
Cedar	46	3.0												
Sugar pine	19	2.9												
Sugar pine	40	3.0												
Sugar pine	49	3.4												

Rate of Growth.

Whether forestry, as a business proposition, under present conditions, is feasible or not depends chiefly upon the time required in which to secure a second crop. The "skinny" or clear cutting method of universal practice in California removes all of the merchantable trees at one cutting without considering the minimum diameter below which cutting is undesirable. A tree 12 inches in diameter adds more new wood growth in a year than one but half this wide. And a very old tree ceases to make any material increase. There is some diameter for each species that represents the maximum rate of growth and volume obtainable in a minimum time. Studies of the rate of growth are made, then, with the view of determining the approximate diameter that trees of different species can be harvested with the greatest profit to the owner.

Many measurements must be taken to secure authentic data. Such detailed investigations could not be conducted this year. Sample plots were selected in average reproduction areas of sugar and yellow pines and white fir. After determining the age of the stand, the diameter and height of each tree was ascertained. The average diameter and height were then computed, and a tree, having these dimensions was selected, felled, and its exact age determined by ring counts.

These measurements show that sugar pine fifteen years old attains a total height of 7.8 feet and a diameter of 2.8 inches 1 foot from the ground and 1.4 inches at a point 4.5 feet from the ground. The area upon which these measurements were made was cut over twenty years ago. If another crop is to be harvested it is unnecessary to linger on the need for protection against fire.

Yellow pine reproduction, on the same cut-over area, was sixteen years old, and had attained an average diameter of 1.6 inches 1 foot from the ground and 0.3 inches at a point 4.5 feet from the ground. The total height was 4.8 feet.

White fir reproduction, on the same area, came in almost immediately after logging for the average tree was nineteen years old. Its diameter at a point 1 foot from the ground was 1.9 inches and 0.9 inches at a point 4.5 feet from the ground. The total height was 7.0 feet.

Few companies have large enough holdings to log so close as the Terry Lumber Company without having to wait for a number of years, after logging the last unit, before the first one cut-over is again ready for the axe. Sawmills cannot remain idle for a great length of time without serious deterioration.

Conclusions.

The Terry Lumber Company is not practicing conservative forestry. Their annual cut is not based upon the annual or periodical increment. No rotation has been established and timber is cut far faster than it produces. Reproduction is given no consideration, and no effort is being made to secure another crop, either naturally or artificially.

No disposition is made of the slash resulting from logging. It increases the fire risk and serves to increase the intensity of fire once started. When fire does occur, all reproduction will be destroyed.

There is no organized system of fire protection. None of the donkey engines or locomotives are equipped with spark arresters; the latter continually plying through inflammable slashings.

Because the present logging operations are conducted without reference to the silvical requirements of the various species, chaparral is fast gaining possession of the cut-over area to the exclusion of merchantable trees. Such areas present difficult and time-taking problems to the forester who would place such lands on a timber producing basis.

SIERRA NEVADA WOOD AND LUMBER COMPANY.

In General.

The examination of this tract was made late in the season and was necessarily brief. It was confined principally to the system of protection and the disposal and condition of the slash.

The company is operating, at present, in Sierra County. The entire holdings in Sierra, Nevada, and Placer counties comprise 65,680 acres, of which approximately 36,308 acres are virgin and 29,372 acres are cut-over. The offices and mill are located at Hobart Mills, about six miles north of Truckee, with which they are connected by a broad gauge railroad. A narrow guage railroad hauls the logs from the two camps, twelve miles northwest of Hobart Mills, to the mill.

The elevation ranges from about 6,000 feet to 8,000 feet above sea level. The slopes are not precipitous, but they are of such character as to make only donkey logging possible. The mill has a capacity of 175,000 feet board measure per day of ten hours.

Effect of Logging.

An approximate diameter limit of 14 inches has been established by the company, but trees are taken down to twelve inches if a good log can be secured. Such a limit means that everything of merchantable size is taken, leaving the area denuded.

A large per cent of the young growth is destroyed during logging operations. Much of this is due to carelessness in felling and skidding and could be avoided.

Fire Protection.

The improved property is well protected. The interior of the mill is equipped with automatic nozzles, and the grounds are well supplied with hydrants and reels of hose. All engines and locomotives have spark arresters. Watchmen are employed to guard against fire at night. Their number is increased at the camps when there is a high wind blowing.

The company does not protect its timber lands and several bad fires have occurred in recent years. The most serious one happened two years ago. It was due to negligence on the part of the company's foreman. It was located on a government cutting and cost the company about ten thousand dollars for damages. A fire like this is conclusive proof that protection pays in the long run.

Two mounted guards would be sufficient to patrol the entire tract. Competent men could be secured for $75.00 per month. The total cost for the dangerous season should not exceed $600. At this rate, the amount lost in the one fire would have protected the entire holdings for a period of seventeen years. And, in addition, the timber that was destroyed would have been saved to the company.

Disposal of Slash.

Most of the slashings on the old cut-over lands have entirely disappeared or are well advanced in decomposition and may not be considered dangerous. But the conditions are bad in the area along the Nevada County road, which was cut over about eight years ago. Here the slash, consisting of broken timber, long tops and branches were left in a jumbled mass and still constitute a serious menace to the reproduction.

The conditions are bad on all of the recently cut-over land. Trees are felled so as to be most accessible for skidding and the slash is left where it falls. No attempt is made to make any real disposition of it, or to lessen the danger to the young growth.

The company, at one time, cut all the branches and tops for fuel, but the additional cost of reloading from the narrow to the broad guaged cars at Hobart Mills made the practice unprofitable and it was discontinued. At present, the tops and the largest branches are cut into long lengths in the woods and sawed into stove lengths by an electrically driven saw for use at Hobart Mills. But not enough of the slash is disposed of in this way to greatly lessen the fire menace. The remainder should be piled away from the reproduction and burned, every fall, after the first rains.

Conclusions.

It is apparent, from a partial study, that this company is not practicing forestry on its holdings. No rotation of crops has been established and the cut is made without reference to the yield. The area is cut so close that no seed trees are left to produce a second crop. No system of fire protection has been established. No real disposal is made of the slash. A small per cent is removed for stove wood, but the remainder is left to form a constant menace to the reproduction.

VERDI LUMBER COMPANY.

In General.

The office and mill of the Verdi Lumber Company are located at Verdi, Nevada, but their timber lands are in the eastern part of Sierra County, California. The tract comprises 14,080 acres of which 4,640 acres are timber land and 9,440 acres are cut-over. Two logging camps are in operation. Camp No. 1 is situated on the line between sections 2 and 3, township 19 north, range 17 east, and Camp No. 2 is in section 1, township 20 north, range 17 east. The bulk of the cut-over land lies between these two camps. The elevation ranges from 4,900 feet at Verdi to approximately 8,000 feet at Crystal Peak. The slopes range from gentle to very steep and can only be logged with donkey engines. The logs are transported from the camps to the mill by a standard gauge railroad.

Fire.

There have been at least three general fires in this locality. Ring counts on the scarred stumps show that they occurred approximately fifty, sixty and seventy years ago, and the numerous charred stubs bear evidence of the extent of damage done by them. The company has been fortunate in recent years in this regard. There have been a few small fires that did a certain amount of damage to the young growth, but no areas of any great size have burned over.

The mill at Verdi is well protected, but the protection system for the timber lands is inadequate. The donkey engines are equipped with spark arresters, and watchmen are employed to look out for fires near the donkeys at night. Dead snags near the engines are cut to lessen the danger. But there is no patrol system during the dangerous season and if a fire should start at any distance from the camps it could easily get beyond control before being discovered and men sent out. The woods superintendent is constantly going between camps, and serves to some extent as guard, but at least one man should be hired during the dry months, whose duties should be purely patrol and extinguishing fires.

Reproduction.

Not enough seed trees have been left on the cut-over lands to reseed them properly. A fair growth of yellow pine is coming in on the old cuttings, but the largest per cent of this was there before logging. Chaparral is making but little headway, and does not interfere with reproduction. Even if a fire is kept out, the second crop will undoubtedly be much lighter than the original stand.

Forest Cover.

The forest cover on this tract occurs mostly in patches and is seldom dense enough to hinder reproduction. The species which occur generally throughout the stand are manzanita, buckthorn, ceanothus, mountain mahogany, gooseberry and chinquapin. Quaking aspens, willow, alder, elderberry, rose, and wild cherry were noted on the moist benches and along the streams. Sagebrush is the principal species of forest cover growing on the dry, open areas.

Ground Cover.

The ground cover in the virgin stand is very good, consisting of a thick layer of needles, humus and duff. On the cut-over lands the cover is thin and is mainly the result of the dropping of needles and the decomposition of the slash. Thimbleberry, cowcabbage, squaw-carpet, and Indian paint brush form the principal growth and these species do not occur in great abundance, except in limited areas.

Logging.

The method of logging is similar to that used by the M. A. Burns Lumber Company. The logs are hauled down dry chutes to the landing by donkey engines. The main chute is about a mile long and laterals are built to increase the area logged by the one chute. Twenty to thirty logs are hauled down the chute at one time by the main "bull" donkey. The logs are hauled from the landing to the mill by a standard guage railroad.

The company is cutting too close. Trees down to a breast high diameter of 15 inches are cut for lumber, and trees from 8 to 15 inches in diameter are cut for cordwood and ties. The land is practically denuded and no seed trees are left to produce a future crop. All species of merchantable sizes are taken. White fir is used principally for chute poles and ties.

A large amount of unnecessary damage is done to the young growth during logging. Trees are often felled in and skidded through thick clumps of seedlings. Most of this damage could be avoided, without expense, by exercising a little care.

The diameter limit for yellow pine should be increased enough to leave sufficient seed trees to reseed the area. The greater per cent of this land is fit for nothing but the growing of timber and more seed trees must be left to secure a second crop.

Waste in Logging.

This company has adopted a policy of very close utilization of its timber, and the unnecessary waste was less than in any other company examined. The stumps are cut down to a height of from 2 to 2½ feet and the tops are utilized to a small diameter. After all the available logs are taken, the remainder of the tops and the larger branches are cut up into cordwood. Inferior species, such as white fir, are cut for chute poles. When an area has been logged, the old chute poles are cut into ties.

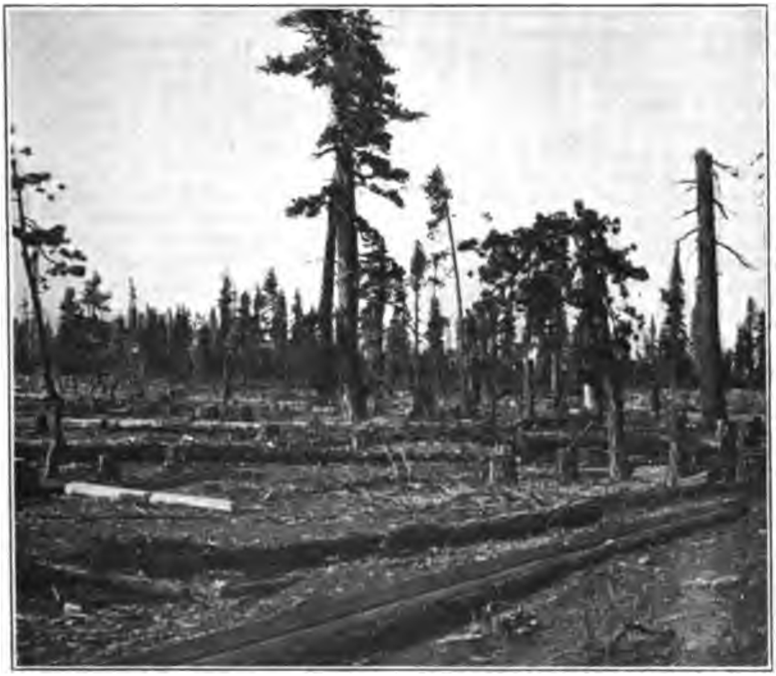

PLATE IX. Waste in logging.

Unused chute poles and long merchantable sections of timber left in the woods to rot. Several trees have been broken by careless felling. Note also the waste from high stumps. A large per cent of this waste could have been utilized at a profit. Several thrifty seed trees would have been left if care had been used in felling. Many of the chute poles could be cut into ties for the logging railroad.

The unnecessary waste can be still further decreased by reducing the height of stumps to from twelve to eighteen inches. Stump heights in this locality have already been lowered from 5 feet on the first cuttings, made forty years ago, to from 2 to 2½ feet at the present time and the limit has not yet been reached. It has been demonstrated on the National Forests that it is entirely practicable to cut down to a height of twelve inches, and the increase in stumpage prices is forcing the lumbermen to waste as little as possible. More care should be used in felling to prevent smashing the top logs. The slash could be more completely utilized for cordwood.

Disposal of Slash.

Nothing was done with the slash on the old cuttings. The branches were not lopped from the tops and the débris was left in a jumbled mass. It has decomposed fairly well, however, and at the present time does not constitute a serious fire menace.

In recent years, the company has utilized a large part of their slash by cutting into cordwood. The tops and larger branches are taken and the rest is left flat on the ground, where it will decompose more rapidly than when it was not lopped. It could be more closely utilized by taking the branches down to a smaller diameter. The remainder should either be more completely scattered or piled and burned each year.

Conclusions.

The Verdi Lumber Company is not practicing conservative forestry. It is cutting the timber without regard to increment. No attempt is made to produce a future crop. The present diameter limit takes practically everything, leaving the area denuded. No seed trees are left to reseed the area. No system of protection or management has been established.

The timber is being closely utilized. Stumps are low, and tops are taken to a small diameter. The slash is cut into cordwood. Old chute poles are cut into ties. The stump height should be still further reduced and more of the slash should be used for cordwood.

STANDARD LUMBER COMPANY.

In General.

The timber holdings owned or controlled by the Standard Lumber Company are located in townships 2, 3, 4 and 5 north, ranges 15, 16, 17 and 18 east, Mount Diablo meridian, Tuolumne County. Their holdings comprise 30,980 acres of timber. They own the land and timber on 15,661 acres, and the timber only on 15,259 acres. Approximately, 5,000 acres have been cut over. The company maintains its offices in Sonora. There also are located its sash, door and box factories. Three sawmills, located at Cold Springs, Empire Mill and South Forks, respectively, are operated by the company. These mills are all situated in the timbered area and, unlike the other companies investigated, where logs are hauled to some point and sawed into lumber, the timber is sawed in the woods. The company also owns two logging railroads; one the "Empire City Railroad," a 30-inch narrow gauge, and the other "The Sugar Pine Railroad," a 56-inch broad or standard gauge. Their operation will be discussed in detail later in this report.

The topography varies from rolling to steep. The area is traversed by small creeks which flow into the north fork of the Tuolumne River from the east and west.

The soil is a deep, moist, sandy loam, with an outcropping of granite boulders at infrequent intervals and a humus covering that varies in depth from ½ to 1 inch. In many places, however, the humus is entirely absent.

The Standard Lumber Company cuts a great deal of Government timber, of which there is quite a quantity on the Stanislaus National Forest, and also buys timber on adjoining lands.

It will take about two years to finish up the operations in the Empire Mill—Gold Springs locality—and then cutting will be commenced on the properties farther north and west.

Fire and Slash.

This company has no fire protection system of patrols and no attention whatever is paid to the disposal of slash excepting in the case of Government timber, where the Forest Service regulations compel them to pile brush and in general clean up the area.

In this region where the company cuts so much timber belonging to others, one could not very well compel them to pile brush. However, a little foresight on the part of the owner when issuing a contract for timber, inserting a clause to have brush piled, would change an area which is now a fire menace to one where the danger from fire is reduced to a minimum.

The company is very careful, and every measure within reason is taken to avoid large fires. Prompt action is taken to extinguish all fires, especially in the vicinity of the mill and logging operations. Orders have been issued to cease everything in case of fire, and fight. This was amply proven on August 22, 1912, when the whole mill force at Empire Mill turned out to fight a fire of 30 acres.

Another important feature in the prevention of fires is the practice of watching logging donkeys. When it becomes necessary to move donkeys, each is followed by six or eight men to put out any fires which may be started. This is an extra precaution and one not always practiced by lumbering companies, for all donkeys as well as locomotives are equipped with modern spark arresters of the forced draft type.

"Log trails" coming down a chute oftentimes start fires due to friction, but men are always either riding the "trails" or going back up the chute in a "boat" and thus usually detect and put out fires so started. But logging operations in this locality will cease in two years and the slash on the entire logged area is in a bad way for future fires.

All the way from Longbarn to Bridgeport, along the beautiful Mono road, this menace is particularly noticeable. More especially does this apply to the area extending one half mile on each side of the road from Bald Mountain to Niagara.

The leaving of the logged-over area in this condition not only makes it very dangerous in case of fire, but also spoils the beauty of the road. The Government requires that a strip of timber 100 feet wide be left on each side of the road on its timber sale areas in this locality.

The Standard Lumber Company has cut all its timber near the Mono highway, leaving a desolate waste that one, riding or driving, cannot forget until reaching the summit. Trees could have been left, with very little expense, at least 30 to 50 feet on each side of the highway. In its present state the whole scene is an eyesore.

To further discuss the dangerous conditions existing here, one must bear in mind the topography of the tract and its distance from the nearest community. The holdings are located on the slopes of Dodge Ridge and Bald Mountain, which slope toward the north fork of the Tuolumne River. With the slash in its present dangerous condition, fire would meet with little resistance until it reached the Stanislaus River.

Sonora, the nearest town, is 26 miles distant, and in all probability a sufficient crew of men could not be transported to the danger zone in time to check its spread. In the mean time, a great deal of government as well as privately owned land would be destroyed. It is essential for the safety of these holdings that this slash be burned.

Forest and Ground Covers.

The forest cover consists of manzanita, deer brush, snow brush, bear clover, coffeeberry, chinquapin, greasewood, grasses, and ferns. As a whole, the cover and humus conditions are exceptionally good except on lava ridges, where it is usually absent.

The soil of the major part of the type is a deep, moist, sandy loam and is in good condition for natural reproduction, except the burned-over areas. In the white fir-cedar type the forest cover and ground cover are in good condition. On this type the forest cover consists of manzanita, western chokecherry, deer brush, snow brush, bear clover, grasses, and ferns. Humus conditions are good excepting on steep slopes, where it is usually absent.

The forest cover grows very thick on cut-over areas located near the tops of ridges and the lava beds.

Logging.

Logging operations are similar to those of any other steam logging proposition. Trees are felled, limbed, bucked into logs and yarded to the chute by means of donkey engines. From here the "log trail" is pulled down the chute by the bull donkey to the landing, and either rolled directly to a car and pulled up an incline to the log dock in the mill and sawed into lumber, as at the Cold Springs mill, or is loaded on to a narrow gauge car, hauled to the mill landing and rolled into the mill on the log deck and sawed, as at the Empire mill. The company has no log pond, but washes the logs by means of a 2-inch fire hose. A minimum diameter limit has been established, below which no trees shall be cut.

Pine is logged exceeding close, but white fir and cedar is generally left unless special orders are received for cedar ties. A second cut is not contemplated, so no rotation of crops has been established, and the annual cut is made without reference to the increment.

Waste in Logging.

The chief waste noted on this tract was that of the chute poles. No effort is made to choose non-commercial species for these poles. Many good sugar and yellow pine logs are used and then left to decay in the woods when operations cease. The company believes that the injury to saws and machinery in handling chute poles, which usually have sand and small stones pressed into them, is a greater expense than the sawed timber is worth. This is perhaps true, but it has been demonstrated by other companies that non-commercial species make satisfactory chute poles, and can be utilized later for ties and thus prevent unnecessary waste.

Aside from this waste, however, the timber is being closely utilized. Trees are carefully felled in order to smash as little as possible and the tops are taken down to a diameter of ten inches. Very few merchantable sections have been left in the woods. Stumps are cut down to a height of 18 to 20 inches.

As would naturally be expected with steam logging, this area is considerably torn up by snaking the logs from the woods to the chutes. On their own lands, the company pays no attention to second growth or reproduction.

Yarding lines are strung with the view of reaching the greatest number of logs from a single setting. This practice naturally causes considerable unnecessary damage to seedlings, saplings and poles. Logs snaked through young thickets smash or uproot everything in their path. The cables are heavy and nothing smaller than a tree 10 inches in diameter is looked upon in the nature of an obstruction. This form of damage can be practically eliminated by a more judicious selection of donkey sites and by more frequent settings. Some additional expense would be incurred but, in the long run, the more conservative and less destructive practice would pay.

Fungi and Insects.

No extensive body of fungi killed timber was found. On the whole, this property is quite free from such depredations. Cedar, however, is in bad condition, but this is a general defect that exists pretty much throughout its natural range in California. But little is known of the fungus attacking cedar, and no attempt has been made to determine practical methods for its control. There is an opportunity for much practical work in this field of investigations. Many problems need the earnest attention of a plant pathologist, and provisions should be made whereby the Forestry Department can undertake, in a systematic manner, a thorough study of fungi affecting the merchantable species of California.

Forest insects, detrimental to standing timber, have destroyed no timber worthy of mention. Various species of bark borers were noted in individual trees. Their numbers were not sufficient to kill groups of trees, and no old "deadings" were observed.

Second Growth.

Several one quarter acre sample plots were taken on representative cut-over land of different ages to show more plainly the actual amount of reproduction coming in. The number of trees over one inch in diameter were counted and tallied by species. The resulting figures show that enough second growth is present on most of this tract to produce a fairly good future crop if fire is kept out. A study was also conducted of the rate of growth of the reproduction. These figures serve as an indication of the length of time that must elapse before the area will again be ready to cut.

Sample Plot No. 4—7 year cutting.—Yellow pine is coming in very thickly, closely followed by sugar pine and cedar. The area is badly in need of protection for a fire now would most certainly destroy the growth.

The amount of second growth is as follows:

Species—	Number.
Sugar pine, 1 to 6 inches in diameter	61
Yellow pine, 1 to 6 inches in diameter	62
White fir, 1 to 4 inches in diameter	29
Cedar, 1 to 4 inches in diameter	31

Rate of growth as determined by stem analysis of an average tree from the area showed the following: Sugar pine, 34 years of age, 3.2 inches diameter outside bark at stump (1 foot high) and a height growth of 13.5 feet.

Sample Plot No. 3—7 year cutting.—Yellow pine very thrifty here also. Amount of growth as follows:

Species—	Number.
Sugar pine, 1 to 6 inches in diameter	40
Yellow pine, 1 to 9 inches in diameter	55
White fir, 1 to 7 inches in diameter	25
Cedar, 1 to 4 inches in diameter	14

Rate of growth on above: Yellow pine, 37 years of age, 4.5 inches diameter outside bark at stump height, and a height growth of 15 feet.

Sample Plot No. 2—5 year cutting.—Yellow pine again predominates with a good thrifty growth. Amount of growth:

Species—	Number.
Sugar pine, 1 to 5 inches in diameter	83
Yellow pine, 1 to 7 inches in diameter	190
White fir, 1 to 7 inches in diameter	15
Cedar, 1 to 4 inches in diameter	30

Rate of growth: A yellow pine, 33 years of age had a diameter of 3.15 inches diameter outside bark at one foot stump and a height of 12.3 feet.

Sample Plot No. 1—5 year cutting.—This area resembles sample plot No. 2 a great deal in character, the yellow pine and sugar pine being present in goodly quantities. Amount of growth:

Species—	Number.
Sugar pine, 1 to 5 inches in diameter	142
Yellow pine, 1 to 5 inches in diameter	70
White fir, 1 to 6 inches in diameter	111
Cedar, 1 inch in diameter	1

Rate of growth: A sugar pine, 26 years of age, had a diameter of 3.0 inches outside bark at one foot stump and a height growth of 10.5 feet.

Reproduction on Recently Cut-over Land.

The purpose of these reproduction studies on recently cut-over land is to determine the amount of reproduction and the number of thrifty trees left on the ground after logging. A comparison of these figures with the stand tables made in the virgin timber shows that from 50 to 75 per cent of the reproduction is destroyed during logging operations.

In each case a plot of one quarter acre was laid off. The diameter and height of each stump was measured and with the chaparral and standing trees over 1 inch in diameter was accurately plotted on a map. The seedlings (under one inch in diameter) were counted by species.

The following tables were compiled from these figures. It needs only a glance at these tables to perceive that no provision is being made for a future crop:

REPRODUCTION ON RECENTLY CUT-OVER LAND.

Plot No. 1.

Stumps.			Species over 1 inch in diameter.					Seedlings.				Remarks.
								1 to 6 feet in height.		Under 1 ft. high.		
Species.	Height (feet).	Diameter outside bark (inches).	Diameter breast high (inches).	Sugar pine.	Yellow pine.	White fir.	Cedar.	Species.	Height (feet).	Species.	Number.	
Yellow pine	3.1	22	2			8		Sugar pine	1.5	Sugar pine	10	
Yellow pine	2.0	27	3			8		Sugar pine	2.4	Yellow pine	4	
Yellow pine	3.3	25	4			1		Yellow pine	1.4	White fir	56	
Yellow pine	2.5	23	5	1			1	Yellow pine	2.0	Cedar	4	
Yellow pine	2.3	12	6		1	1		Yellow pine	1.8			Torn and smashed.
White fir	7.1	36	7			1						Girdled and dying.
			8		1							Girdled by guy lines.
			14		1							
			18		2							
			20		1							

Plot No. 2.

Stumps.			Species over 1 inch in diameter.					Seedlings.				Remarks.
Species.	Height (feet).	Diameter outside bark (inches).	Diameter breast high (inches).	Sugar pine.	Yellow pine.	White fir.	Cedar.	Species.	Height (feet).	Species.	Number.	
Sugar pine	2.75	48	24				1			Sugar pine	6	Dead top.
Yellow pine	3.0	46								Yellow pine	8	Area is being reseded by timber on adjacent government land.
Yellow pine	2.75	50								White fir	7	
Yellow pine	3.0	38										
Cedar	2.5	47										
Yellow pine	2.1	40										
Yellow pine	2.5	28										

Plot No. 3.

Sugar pine	2.8	42	2			1		Sugar pine	1.5	Sugar pine	22	
White fir	2.5	33	4			1		Sugar pine	1.3	Yellow pine	6	
White fir	2.1	19	20				1	Sugar pine	1.7	White fir	54	Dead; badly burned at butt.
Cedar	2.1	26	22		1			Sugar pine	2	Cedar	26	Top broken; alive.
White fir	2.5	30	23			1		Sugar pine	1.5			Top broken; dead.
White fir	2.8	40	25			1		Sugar pine	2.0			
			26			2		Sugar pine	2.0			Both dead and smashed.
			34			1		Sugar pine	1.0			Top broken; dead.
			36			1		Sugar pine	1.0			Shaky butt; alive.
			38			2		Yellow pine	3.0			Dead.
			42			1	1	Yellow pine	1.7			White fir dead; cedar alive, burned at butt.
								Yellow pine	2.0			
								White fir	1.8			
								White fir	1.5			
								White fir	3.0			Area needs protection from fire.
								White fir	2.0			
								White fir	2.5			
								White fir	2.0			
								White fir	1.1			
								Sugar pine	3.0			
								Sugar pine	3.0			
								Sugar pine	3.0			
								Sugar pine	3.0			

Conclusions.

The most important condition to consider on this tract is that of disposal of old as well as new slash. The entire cut-over area is in a dangerous condition, especially in the vicinity of the Mono highway. The menace is increased by the fact that logging operations will soon cease and help will not be available in case of fire. The slash, in at least the most dangerous locations, should be piled and burned before the company leaves this vicinity.

Forestry is not practiced by this company. The cut is made without reference to yield. The lands are not adequately protected from fire, and no rotation of crops is carried on. No attention is paid to the producing of a second crop, and no seed trees left to reseed the land. Natural reproduction is excellent in this locality, and an adequate system of protection would be sufficient to insure at least a fair future stand of timber.

WESTSIDE LUMBER COMPANY.

In General.

The Westside Lumber Company, successors to the Westside Flume Lumber Company, own 54,670 acres in the central part of Tuolumne County. Of this 39,590 acres are timber land and 15,080 acres have been cut over. The original company commenced cutting operations in 1900 and continued until 1903, at which time the present company obtained possession. The tract, which is located on the drainage basin of the Tuolumne River, is rough and mountainous, cut by narrow cañons and small tributary streams heading in this locality. The elevation ranges approximately from 3,400 to 5,500 feet above sea level. Logs are hauled from the camps to the mill at Tuolumne, a distance of 28 miles, by a narrow gauge railroad. The mill has a capacity of 250,000 feet board measure per day. From here the finished products are shipped via Sierra Railroad to Oakdale and thence via Southern Pacific Railroad to destination.

Fire

Several bad fires have occurred on this tract in recent years. The most serious one burned over 600 to 800 acres near "Little Chicago," about five years ago. All the second growth, composed chiefly of yellow pine and white fir, with the exception of occasional seedlings which were protected by big rocks, was destroyed and chaparral is slowly gaining possession of the area.

Another bad fire broke out this summer (1912) near Camp. No. 22, burning over an area of 500 or 600 acres. The soil cover and reproduction were entirely destroyed and three or four inches of ash cover the ground in most places. Unless this area is planted it will undoubtedly remain a waste and be taken possession of by chaparral.

The locomotives and donkey engines, though equipped with spark arresters, have been the means of causing several fires. Several have been due to incendiarism, but the offenders were never caught.

No organized system for protection is maintained. However, the company endeavers to prevent fires as far as is possible without such a system. In addition to equipping the locomotives and engines with spark arresters, the trainmen, grading crew and other employees have strict orders to put out all fires and the whole crew has been called out on several occasions. No patrol is kept on the railroad right of way. When a fire is too large to be handled by the section or grading crews, a general alarm is sounded and the entire woods crew responds. It is usually fought by means of trails and back-firing.

At least two men, whose duties are purely patrol, should be hired during the summer months. The company would then be insured against a repetition of disastrous fires such as the two described above. These men could locate a fire and get a crew to the danger zone before it gained headway.

Forest Cover.

Several species of chaparral were found in this locality. Manzanita occurs in small patches in openings of the forest and occasionally along old roads and railroad beds. Bear clover is thickly scattered over the entire timbered area, especially in the openings. As a rule, seedlings will not grow under thick bear clover. Deer brush and buck brush occur in a few scattered patches along with manzanita, near old chutes and tops of ridges. Sorrel and mullen grow along the railroad, but do not interfere with reproduction. Scrub or mountain oak, elderberry, gooseberry and aspen, with various small flowering plants, occur in openings on the slopes, beside the streams and in the canyons.

Grazing.

The Westside Lumber Company leases its cut-over land for grazing purposes. A policy similar to that of the government has been adopted which prevents overgrazing the allotted range. Approximately 10,000 acres are used for this purpose. Several drift fences have been built, and as grazing is permitted only during the summer months, the injury to young growth is reduced to a minimum. The stockmen strongly oppose the burning of cut-over land for, when it is done, the carrying capacity of the range is reduced. Since the stockmen are anxious to graze as many head per acre as possible, they offer active assistance in fire detection and protection and, if necessary, in fighting fire.

Logging.

Because of the rough character of the country logging is done entirely with donkey engines. The original company logged under a selection system, removing only the largest and best trees, and a good pole stand, with an abundance of reproduction, remains. The older cuttings, up to 1905 or 1906, of the present company, are in much the same condition, but as operations have proceeded north into townships 2 and 3 north, range 17 east, a smaller cutting diameter has been adopted. As a result, in a region where white fir and yellow pine are about on a par for predominance in the forest type, white fir and cedar are forming the principal components of the second crop.

Only one logging camp is run at a time. The logs are hauled up greased chutes to the landing. These chutes are usually built of white fir, but yellow and sugar pine are oftentimes used. When operations are through, the fallers buck up the good pine and haul it in the same as other timber, or if not too far to move, it is used in other chutes.

There is no standard diameter cutting limit. It depends on the market and demand. If the company has a big order for cedar, orders are issued from the office to cut anything worth taking, fence-post material, etc.; the same is true of other species. However, during the investigation no trees under 14 or 18 inches were being cut.

Waste in Logging.

An unusual amount of tops of large diameters are smashed in falling, due to timber being felled downhill. This is often unavoidable, but in many cases it is the result of carelessness or indifference on the part of the faller. A tree is broken more or less in merely falling, but to make it worse, another possible log or two is smashed by sliding 100 to 150 feet down the slope and crashing into other timber.

There is also a great unnecessary waste in the logging chutes. All but the best yellow pine poles are left to decay in the woods. Many of these poles could easily be cut into ties for their railroad.

The chief damage is undoubtedly that done to the young growth by the yarding operations. Much of this is unavoidable, but the damage is great because of the thickness of the young growth. Young trees are uprooted, broken and bent over. The soil is badly plowed up, killing whatever reproduction was present and leaving openings in the thick stands of yellow pine.

Sample plots were taken on representative cut-over land in order to show graphically the actual waste. Each sample plot represents one quarter acre of cut-over land. The species of each stump was noted, its diameter and height were taken; the length of the unused top and the unused merchantable section (or length of top down to a 6-inch diameter) were measured. It may be seen from these measurements that a merchantable section ranging from 12 to 26 feet in length was left in each top. Some of these sections were broken by careless felling, but a good log could have been secured from the others. Each tree over 6 inches in diameter left standing was also measured and its condition noted. These figures show that no sound trees of sufficient size to reseed the area have been left.

WASTE IN LOGGING.

Sample Plot 1.

Stumps.			Unused tops.		Unused merchantable section.		Trees 6 inches and over in diameter left standing.			
Species.	Diameter outside bark. (inches).	Height (feet).	Total length of top (feet).	Diameter outside bark at butt end (inches).	Length to 6 inch diameter (feet).	Diameter outside bark at butt end (inches).	Species.	Diameter breast high (inches).	Condition.	Remarks.
Yellow pine	30	2.5	52	18	37	18	White fir	6	Good.	*Unused portion of yellow pine, 36-inch diameter, badly smashed. Unused portion of yellow pine, 47-inch diameter, badly smashed; no good.
Yellow pine*	36	2.4	62	19	40	19	White fir	8	Good.	
Cedar	48	3.2	58	20	38	20	White fir	7	Good.	
Cedar	39	2.9	53	18	34	18	Yellow pine	6	Good.	
Sugar pine	52	3.0	63	22	42	22	Yellow pine	6	Good.	
Yellow pine†	47	2.8	68	26	54	26	White fir	7	Good.	†This area was covered with a thick stand of yellow pine.
Sugar pine	28	2.5	46	16	28	16	Yellow pine	12	Good.	
							Yellow pine	14	Good.	
							Yellow pine	10	Good.	
							Sugar pine	8	Good.	
							Sugar pine	6	Good.	
							Yellow pine	7	Good.	
							White fir	6	Good.	White fir saplings and poles.
							Sugar pine	8	Good.	

Sample Plot 2.

Sugar pine[1]	43	2.5	37	12	11	12	Cedar	48	[1] O. K. in form but poor.
Yellow pine[2]	29	1.5	34	14	18	14	Oak	80	[2] Crooked; top broken. Smashed.
Yellow pine[3]	54	2.0	58	22	34	22			[3] Badly smashed.
Yellow pine[4]	51	2.5	62	24	36	24			[4] First log fair, rest smashed.
Yellow pine[5]	30	1.3	48	20	24	20			[5] Badly smashed; beyond measuring.
Yellow pine[6]	36	1.2	57	24	34	24			[6] Forked at 24 inches, making top extra long.
Yellow pine[7]	44	2.9	55	22	30	22			[7] Badly smashed.

NOTE.—This area is located on steep slope, hence in felling nearly all tops over 24 inches in diameter were smashed. Eighty acres in this vicinity is in the same condition.

Disposal of Slash.

No attempt is made to dispose of the slashings. It is considered too great an expense to pile and burn, and the problem is handled in this manner. Every fall, after the first rains, their dangerous cut-over areas are burned broadcast. It is the opinion of the company that this method does no damage to reproduction or ground cover at this season of the year. They believe that while it may kill many seedlings, they will come up much faster the next year because of the improved condition of the soil. Nearly all of their cut-over lands of the past 6 or 7 years have been burned over, and taken as a whole, are in excellent condition to produce a future crop, providing that fire is kept out.

Fungus and Insect Damage.

There is apparently no damage due to these agents with the exception of the unknown, or little known of, fungus which causes the perforation of cedar. All cedar seems to be subject to this fungus. The larger trees, and more or less the medium sized ones also, are often riddled as if by an insect. However, there seems to be a ready sale for cedar for use in making ties, telphone poles, and fence posts. The quality of cedar in this region is better than the average.

Reproduction.

Sample plots of one quarter acre each were taken on the various aged cut-over areas in order to show exactly what is coming in to form the second crop. The number of each species present was determined and the diameters measured. A stem analysis was then made of a tree of average size for each plot. It was cut into one-foot sections and the age of each section was determined by ring counts. These figures serve as an indication of the rate of growth of the reproduction and give an idea of the length of time that must elapse before the cut-over land will again be ready to log.

Sample Plot No. 1—5-year cutting.—This area is rapidly being reforested with yellow pine, sugar pine and cedar, and is in good condition for a second crop. The amount of second growth is as follows:

Species.	Number.
Sugar pine, 1 to 6 inches in diameter	26
Yellow pine, 1 to 11 inches in diameter	49
White fir, 1 to 6 inches in diameter	89
Cedar, 1 to 4 inches in diameter	28

Rate of growth: for the average tree, a yellow pine of 4.5 inches diameter at one foot from the ground was taken. This tree had a total height of 13.1 feet and was found to be 30 years old.

Sample Plot No. 2—6 year cutting.—This area was also in excellent condition to produce a second crop. The amount of second growth was as follows:

Species.	Number.
Sugar pine, 1 to 5 inches in diameter	29
Yellow pine, 1 to 14 in diameter	106
White fir, 2 inches in diameter	1
Cedar, 1 to 6 inches in diameter	15

Rate of growth of area as determined by stem analysis: Cedar, 33 years of age, 5.3 inches diameter stump height and 12.3 feet high.

Sample Plot No. 3—10 year cutting.—Portions of this area were taken possession of by chaparral. The area has been burned over but conditions have been so ideal, the ground being flat or rolling and being near an abundance of timber, that the area is rapidly being reforested by yellow pine.

Amount of second growth found (the area will not show many seedlings because of a portion being solely chaparral):

Species.	Number.
Sugar pine, 1 to 9 inches in diameter	84
Yellow pine, 1 to 8 inches in diameter	134
White fir, 1 to 8 inches in diameter	18
Cedar, 1 to 10 inches in diameter	36

Rate of growth: Sugar pine, 34 years old, 6.5 inches diameter stump height and 16.4 feet high.

Sample Plot No. 4—12 year cutting.—Has a good pole and sapling stand with many trees 18 to 30 inches in diameter to reseed the area. No fires have been through here and the area is in fine shape for a second crop. Amount of second growth found:

Species.	Number.
Sugar pine, 1 to 8 inches in diameter	24
Yellow pine, 1 to 13 inches in diameter	39
Cedar, 1 to 4 inches in diameter	104

Rate of growth: Yellow pine, 15 years of age, 5 inches diameter stump height and 17.2 feet high.

Many seedlings, saplings, and second growth in general were destroyed in logging. In many cases this is unavoidable but, as a rule, more care could have been taken.

In comparison with seedling counts made in virgin timber, the cut-over seedling counts show a destruction of 60 to 75 per cent of the undergrowth.

Reproduction on Recently Cut-over Land.

Reproduction studies were made on recently cut-over land to determine the amount of reproduction and the number of trees left after logging. Each sample plot contains one quarter acre and was selected to represent average conditions. The diameter and height of each stump was taken and its species noted. Stumps, chaparral and trees over 1 inch in diameter were accurately plotted on a map, while the seedlings were counted and recorded by species. The results show that no seed trees of the valuable species have been left to reseed the land. Enough young growth is present to produce a fair stand if the area is well protected, but a fire of any consequence would be disastrous.

The following tables were compiled from this data and showed at a glance the deplorable lack of thrifty seed trees:

REPRODUCTION ON RECENTLY CUT-OVER LAND.

Stumps.			Species over 1 inch in diameter.					Seedlings.				Remarks.
								1 to 6 feet in height.		Under 1 ft. high.		
Species.	Height (feet).	Diameter outside bark (inches).	Diameter breast high (inches).	Sugar pine.	Yellow pine.	White fir.	Cedar.	Species.	Height (feet).	Species.	Number.	
Plot No. 1.												
Yellow pine	2.8	40	1	3	8	6	9	White fir	3	Sugar pine	17	Many yellow and sugar pine and white fir saplings, 1 to 7 inches in diameter, which were dead and broken, due to logging, found on this plot.
Yellow pine	2.2	36	2	1	2	5	8	White fir	4	Yellow pine	56	
Yellow pine	2.2	38	3	2	8	5	2	White fir	5	White fir	3	
Yellow pine	2.3	27	4	1		8	2	White fir	6	Cedar	42	
Yellow pine	2.4	52	5		1	3	2	White fir	4			
Yellow pine	2.4	25	6	1		3		White fir	3			
Yellow pine	2.5	43	7		1	2	1	Yellow pine	2			
Yellow pine	1.8	24	56				1	White fir	3			
White fir	1.8	10	60				1	White fir	3			
Cedar	2.0	32						White fir	5			
White fir	2.1	11						Sugar pine	6			
Yellow pine	2.5	21						Cedar	5			
								Yellow pine	6			
								Cedar	1			Shaky and burned butt.
								Cedar	1.5			Dead top; fairly good.
Plot No. 2.												
Yellow pine	3.0	50	1	3	2	6	7	White fir	5	Sugar pine	15	A great deal of slash on Plot No. 1. and much of the second growth is broken, bent, and dying because of logging.
Yellow pine	2.6	40	2	1	2	1	8	White fir	4	Yellow pine	10	
Yellow pine	2.3	44	3	2	1	1	2	White fir	5	White fir	97	
Sugar pine	2.4	50	4	2			4	Sugar pine	4	Cedar	92	
White fir	2.5	40	5	1		1	2	Cedar	2			
Yellow pine	2.0	40	6				1	Sugar pine	3			
White fir	2.5	30	7	1		1		Cedar	5			
White fir	2.8	38	8		1			Cedar	4			
			10			1		White fir	2			
			18			1		White fir	5			
			20			1		Cedar	4.5			
			26			1		White fir	6			
			36			1		White fir	5			
								Cedar	4			
								Cedar	2			
								Cedar	3			
								Sugar pine	2.5			

Conclusions.

The Westside Lumber Company is not practicing conservative forestry. Their cut is made without reference to the yield. No system of management or protection is in operation. Future yield is being left to chance.

No diameter limit has been established. Practically everything is cut from which a log can be secured. Although the reproduction is good on most of the cut-over land, there are denuded areas where planting will be necessary to produce a second crop.

More care should be exercised in felling timber. The present method of felling down hill causes a great amount of damage.

The system of fire protection now in operation is inadequate. At present, unless a fire is large and endangering company timber or improved property, it is given but little attention and is left to burn itself out.

THE HUME-BENNETT LUMBER COMPANY.

In General.

The Hume-Bennett Lumber Company, successors to the Sanger Lumber Company, own approximately 22,240 acres of land in the southeastern part of Fresno County. Of this amount, 5,280 acres are timber land and 16,960 acres have been cut over. The original company commenced cutting in 1890 and continued until 1905 when the present company took possession. The elevation of this tract ranges from 5,000 to 6,200 feet above sea level. The country, with the exception of a few basins and broad, rolling hilltops, is rocky and mountainous with narrow cañons and steep-sided ridges.

Logging operations center about Hume, situated on the shores of Lake Hume, 58 miles from Sanger. The lake was artificially made by damming a natural basin into which flow Ten-mile Creek and one or two smaller creeks. It is used as a mill pond and to furnish water for the flume between Hume and Sanger.

Fires.

With the exception of one that burned over between 80 and 100 acres of cut-over land within a half mile of Hume about three years ago, there have been no bad fires on this tract in recent years. This fire was checked before it reached the timber, but a fine stand of yellow and sugar pine reproduction was destroyed and the area is now in possession of the chaparral.

An inadequate system of protection is maintained. No general system of patrol has been established, but the railroad right of way is patroled by a force of two to six men during the dangerous season. Although the locomotives are equipped with spark arresters, the largest per cent of the fires occur along the right of way. With this system most of the fires are discovered in their incipiency and can be handled by the patrol. In the case of a large fire, prompt assistance can be secured for the camps are within a radius of five miles of the sawmill and are connected by telephone.

While such a method of protection is perhaps adequate at the present time, it is only a matter of a few years before the company will cease operations in this locality. The entire tract is in a dangerous condition because of the unburned slash. This danger increases yearly and will be at a maximum at just the time the company ceases cutting and withdraws its patrol. If these lands are not protected in the future the possibility of securing a second crop is extremely remote. With the area in its present condition almost any sort of fire would destroy practically all reproduction. This is one of the strongest arguments for State protection of the cut-over lands. An efficient patrol maintained by the State would eliminate these disastrous fires and insure a future supply of timber to the people of California. A large per cent of the cut-over lands are fit for nothing but the growing of timber and the lumbermen will not pay taxes and protect them for the length of time necessary before another crop can be harvested. Much of this land will eventually revert to the State. It is obvious that the protection of this land is of great value. "The indirect protective influences of the forest, the continued supply of a certain amount of useful products, the maintenance of certain industries which could not otherwise continue to exist in this region, are all of great advantage to the people and contribute largely to the actual creation of wealth and prosperity. They justify public forestry even if they involve a continued outlay of money."*

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*Henry S. Graves: "Principles of Handling Woodlands."

Forest Cover.

The species of chaparral found on this tract are manzanita, buckthorn, chinquapin, snow brush and buck brush. It does not grow in abundance in the virgin forest, but occurs in the openings, on the tops of ridges, above timber, and on cut-over land. As yet, the forest cover is doing no harm to reproduction. Yellow pine, white fir and cedar are making a rapid growth on the cut-over lands and most of the chaparral will probably be driven out in a few years.

Ground Cover.

The ground cover is composed of needles, duff and humus, forming a layer several inches in thickness throughout the entire forest. Various small flowering plants such as the tiger lily grow in the moist situations. The cover is in excellent condition and with the sandy loam soil makes ideal germination conditions.

Logging.

The operations of the original company were very destructive. They removed only the best logs and necessarily left much valuable timber in the woods. Many of the trees were left on the "big tree" tract because the steepness of the slopes would not allow a profitable cutting. As a result, the area is now covered with a fair stand of young "big trees" and if fire is kept out, will soon resume its value as a watershed.

A more conservative policy has been adopted by the present company. An approximate diameter limit of 14 inches has been established and tops are taken down to a small diameter. The logs are yarded to the "chutes" by donkey engines or are taken directly to the landing with "high wheels." From the landings, they are hauled to Hume and dumped into the mill pond. After the lumber is sawed, it travels by flume in "clamps" to Sanger, where it is piled and shipped via Fresno on the Southern Pacific to the market.

From the standpoint of conservative forestry, the present diameter is too small. Very few seed trees are left to reseed the denuded areas. The few thrifty trees that are left after logging are taken by the tie cutters for their railroad.

Waste in Logging.

A large per cent of the large growth is destroyed by carelessness in logging. Many small trees are smashed by falling timber. Others are bent over, bark and branches are torn off, or torn up by the roots by reckless yarding. Some of this damage is unavoidable but much of it can be prevented.

Considerable timber is smashed in falling. Part of this damage could be avoided by using more care. Much of the broken timber, now going to waste, could be used for firing the donkeys.

Sample plots of one quarter acre each were taken in representative localities to show the actual waste left on the ground. The stumps were measured to determine the lengths left, which could have been utilized. Many tops were found, from which another log could have been secured, and ties could have been made from many more. The tie cutters consider the tops too knotty to hew into ties and instead go over the cut-over lands, taking the good trees that the loggers have missed. Many good seed trees would have been saved if the tie cutters were made to utilize the tops left in the woods. The following tables show the principal forms of waste. They also give an idea of the number of trees of each species over six inches, left after logging. It is from these trees that a large part of the area must receive its seed for the future stand:

Stumps.			Unused tops.		Unused merchantable section.		Trees 6 inches and over in diameter left standing.		
Species.	Diameter outside bark (inches).	Height (feet).	Total length of top (feet).	Diameter outside bark at butt end (inches).	Length to 6 inch diameter (feet).	Diameter outside bark at butt end (inches).	Species.	Diameter breast high (inches).	Condition.
Plot No. 0.									
Sugar pine	38	3.0	35.7	12	13.7	12	White fir	12	Alive; uninjured.
Yellow pine	30	3.5	30.0	13	12.2	13	Cedar	8	Alive; dead top.
Yellow pine	28	3.0	34.6	14	6.0	14	Yellow pine	14	Dying; top broken.
Cedar	36	3.5	17.1	5	None.		Yellow pine	8	Dying; top bent.
Sugar pine	58	2.75	40.4	17	22.4	17	Cedar	28	Alive; dead top.
Cedar log	12 feet long and 39 inches in diameter.								Rather shaky; useless.
							Cedar	32	Dead on one side; shaky butt.
							White fir	12	Alive; undamaged.
Plot No. 1.									
Sugar pine	30	2.0	62.0	21	37.0	21	Yellow pine	6	Good.
Yellow pine	41	1.5	38.0	6	None.		Yellow pine	5	Good.
Yellow pine	26	2.0	41.4	12	9.4	12	Yellow pine	22	Very poor, knotty and unmerchantable.
Yellow pine	26	2.4	28.5	11	15.0	11	Yellow pine	7	Good.
Yellow pine	33	2.5	44.0	16	10.0	16	Yellow pine	8	Good.
Yellow pine	36	2.6	31.0	9	7.0	9	Yellow pine	9	Good.
Yellow pine	24	1.8	31.0	6	None.		Yellow pine	7	Good.
Yellow pine	37	2.6	46.5	18	24.5	18	Yellow pine	6	Good.
							Cedar	8	Good.
							White fir	9	Good.
							Cedar	6	Good.
Plot No. 2.									
Yellow pine	26	2.5	34	9	8	9	White fir	42	Dead.
White fir	24	2.4	41	8	10	8	Cedar	32	Good.
Yellow pine	38	2.3	44	13	16	13	Cedar	38	Good.
White fir	25	2.5	32	11	10	11	White fir	6	Good.
White fir	26	2.3	35	8	7	8			
Plot No. 3.									
Cedar	28	3.0	36	14	22	14	Yellow pine	6	Good.
White fir	30	2.8	30	16	20	16	Yellow pine	7	Broken top.
Yellow pine	20	2.7	50	15	38	15	Yellow pine	9	One half broken off by falling tree.
Yellow pine	21	3.0	46	15	30	15	Cedar	22	Good.
Sugar pine	24	2.3	38	18	18	18			
Sugar pine	32	3.0	42	17	23	17			
Cedar	44	3.6	54	21	36	21			

Disposal of Slash.

No disposal of slash is made by this company. The branches are not lopped from the tops and the débris is left in a badly jumbled mass. As a result, the entire cut-over area is in a dangerous condition. While the company remains in this locality the menace is minimized for the tract is fairly well protected, but the time is not far away when operations will cease and the company will seek other areas. A fire then would burn unchecked and do inestimable damage to the second growth. Slash is, unquestionably, the most serious existing menace to second growth and should be burned each year in order to give the land a better chance to bear another crop of timber.

Reproduction, Second Growth.

Several one quarter acre sample plots were taken on representative cut-over land of different ages to show more plainly the actual amount of reproduction coming in. The number of trees over one inch in diameter were counted and tallied by species. The resulting figures show that enough second growth is present on most of this tract to product a fairly good future crop if fire is kept out.

A study was also conducted of the rate of growth of the reproduction. These figures serve as an indication of the length of time that must elapse before the area will again be ready to cut.

Sample Plot No. 1, near Indian Basin—Cut-over in 1901. The amount of second growth is as follows:

Species.	Number.
Yellow pine, 1 to 13 inches in diameter	107
White fir, 2 to 3 inches in diameter	6
Cedar, 1 to 5 inches in diameter	12

The average tree for this tract was 3.93 inches in diameter and 14.74 feet in height.

Sample Plot No. 2—6-year cutting:

Species.	Number.
Sugar pine, 1 to 2 inches in diameter	6
Yellow pine, 1, 2 and 3 inches in diameter	5
White fir, 1 to 7 inches in diameter	12
Big Trees, 1 to 11 inches in diameter	20

The average tree was 2.96 inches in diameter and 9.72 feet high.

Sample Plot No. 3, Converse Basin—16 year old cutting:

Species.	Number.
Sugar pine, 1 to 8 inches in diameter	21
White fir, 1 to 7 inches in diameter	48
Big trees, 1 to 6 inches in diameter	9

The average tree was 3.5 inches in diameter and 14.2 feet high.

Sample Plot No. 4, near Millwood, Sequoia Lake—22 year old cutting:

Species.	Number.
Sugar pine, 1 to 5 inches in diameter	8
Yellow pine, 1 to 15 inches in diameter	56
Cedar, 1 to 10 inches in diameter	101
White fir	2

The average tree was 4.54 inches in diameter and 15.46 feet high.

Reproduction on Recently Cut-over Land.

Reproduction studies were made on recently cut-over land to determine the amount of reproduction and the number of trees left on an area after logging.

In each case a plot of one-quarter acre was laid off, stumps were measured and with chaparral and trees left, over 1 inch in diameter were accurately plotted on a map. The seedlings, those trees under 1 inch in diameter were counted by species.

The following tables were compiled to show the results of these studies on each plot:

REPRODUCTION ON RECENTLY CUT-OVER LAND.

Plot No. 1.

Stumps.			Diameter breast high, (inches).	Species over 1 inch in diameter.				Number of seedlings under 1 inch in diameter.				Remarks.
Species.	Diameter outside bark, (inches).	Height. (feet).		Sugar pine.	Yellow pine.	White fir.	Cedar.	Sugar pine.	Yellow pine.	White fir.	Cedar.	
			1	11	7	9	36	72	14	37	63	This area was formerly composed of yellow pine, white fir, cedar, and some sugar pine. Cedar and white fir reproduction abundant.
White fir	42	2.0	2			1						
Yellow pine	28	2.5	3									
Yellow pine	14	2.5	4			1						
			5				1					
			6									
			7	1		1	2					

Plot No. 2.

Stumps.			Diameter breast high, (inches).	Species over 1 inch in diameter.				Number of seedlings under 1 inch in diameter.				Remarks.
Species.	Diameter outside bark, (inches).	Height. (feet).		Sugar pine.	Yellow pine.	White fir.	Cedar.	Sugar pine.	Yellow pine.	White fir.	Cedar.	
White fir	24	2.4	1	9	9	6	5	18	11	15	107	Elevation: 5,500 feet. Reproduction is not very good, and white fir and cedar undoubtedly will be the next crop. Original stand was composed chiefly of yellow pine and cedar with subtype of sugar pine and white fir. The young growth has been damaged considerably by skidding, yarding, felling, guy lines, etc., which could have been avoided. Ground cover: 3 to 4 inches of needles and duff on top of subsoil of black loam.
Sugar pine	30	2.5	2	1			1					
Cedar	22	2.7	3									
Cedar	24	2.0	4									
Yellow pine	18	1.6	5									
Yellow pine	38	2.9	6		2							
Yellow pine	26	2.3	7	1			1					
Yellow pine	27	2.0	8									
Yellow pine	32	2.0	9		1							
Yellow pine	33	2.9	10									
Yellow pine	37	3.0	11									
Cedar	25	2.0	12									
Yellow pine	31	2.7	13	1								
Cedar	22	1.5	14		1							
Yellow pine	26	2.6	15									
Cedar	34	1.8	16			1						

Plot No. 3.

Sugar pine	33	3.0	1	29	15	87	62	33	21	62	120	This area was logged by means of big wheels, so area is pretty well cleaned. Reproduction is in good condition; butts need protection as fire would destroy it entirely.
Yellow pine	30	3.5	2	2								
Yellow pine	29	3.0	3		1		1					
Cedar	36	3.5	12			2						
Sugar pine	58	2.75	14		1							
			28				1					
			32				1					

The results of these tables in comparison with actual seedling counts in virgin timber show that about 75 per cent of all seedlings are destroyed by the present method of logging. Half of this could be avoided by using a little care, particularly in yarding.

Conclusion.

The Hume-Bennett Lumber Company is not practicing forestry on its holdings. The cut is made without reference to the future yield. The diameter limit is too small to leave sufficient seed trees. Restocking to cut-over lands is left to chance.

The entire cut-over area is in a dangerous condition. The slash has been left lying on the ground and a fire burning through this tract would destroy practically all of the second growth. Protection is necessary to insure a future stand of timber. An efficient patrol maintained by the state would insure a fair second crop to future generations. At present, the lands are in a measure protected by the company, but when operations are moved to some other locality this protection will cease, and the area will be left to the mercy of the first fire that may start.

The slash should be piled away from the reproduction and burned each year in the proper season. In this way the danger to the second growth would be greatly lessened. But fire danger can never be entirely removed. Patrol will always be necessary if we are to secure a maximum second crop from our cut-over lands. But the proper disposal of slash will minimize this menace and greatly lessen the intensity of the patrol that would otherwise be needed.

More care should be exercised in logging to save the second growth. Under present conditions, approximately 75 per cent of all the reproduction is destroyed by cutting operations. A large part of this is due mainly to carelessness and could be avoided without increased expense.

SUMMARY.

The area covered in this study consists of 552,303 acres, of which 186,758 acres have been cut over and 365,545 acres are virgin. Ten lumber companies are represented in this acreage. Because of the magnitude of the task and the limited time available, it was impossible to cover all of the private holdings, but these companies were carefully selected to represent all existing conditions in the tracts under operation, exclusive of the redwood belt. It is safe to assume that the conclusion drawn from this study will apply equally well to the entire region. None of the companies are practicing conservative forestry. The cut is being made without regard to increment. Future yield is left largely to chance. No working plans were in use.

Most of the holdings are inadequately protected from fire. Only three companies maintain a paid patrol. Two have not even equipped their engines with spark arresters. Seven companies, or 70 per cent of all those examined, do practically nothing to protect their timber or cut-over lands.

Four companies dispose of their slash. In two cases, it is piled and burned each year. In one, it is burned without piling. The fourth cuts it into four-foot lengths and sells it for cordwood. Reforestation is not being undertaken on a commercial scale. Two companies, whose holdings were not investigated, are doing some experimental planting.

The chief sources of waste are high stumps, breakage in falling, cutting even length logs, and unused tops containing merchantable lumber.

The tracts are being cut so close that most of the present owners will not consider a second crop. Two companies are developing the stock industry on their cut-over lands. These lands present a problem and as yet no definite policy has been formulated for their management.

CONCLUSIONS.

Inasmuch as the properties examined are representative, it is safe to assume that forestry is not practiced on our private lands in California. There is no state control of these lands. No laws compel the companies to log in such a way as to retain the greatest value of the lands for watersheds, or to provide for a future crop of timber in a minimum length of time. No one interest can be greater than the interests of all the State. It is obvious, however, that the lack of conservative forest management will eventually seriously interfere with the maintenance and development of those industries that depend largely upon watersheds or irrigation for their development. Forest destruction has already caused a damage of many millions of dollars, by silting up navigable rivers and reservoirs, by causing an increase of spring floods and a deficiency of water in the summer, and by the drying up of sources of water used for irrigation and for domestic purposes. This damage is already so great as to form one of the principal causes of the demand for forestry. Eventually there must be state control so that each interest may be in a measure subservient to the others. We must not permit an industry that owes its very existence to our natural resources to disappear because of corporate greed. The State should fulfill its responsibility in the matter of aid to the private owners in fire protection and taxes so that it will be possible for them to practice a system of forestry that will at least maintain the minimum of production.

The cut-over lands must be protected from fire so that they may furnish a perpetual yield, and continue to give employment to the large army that are dependent upon the lumber industry. An efficient state patrol, maintained by the State, is the only practical way to secure this protection. An appropriation is necessary to secure such a patrol.

There should be compulsory burning of slash on all cut-over lands. The presence of dry tops, branches and piles of brush in the forest constitutes the greatest menace from fires. The severity of a fire and hence, the damage done, is in direct proportion to the amount of dry litter on the ground. In addition to this, a fire becomes almost impossible to control when burning through dry brush. Burning of slash has been compulsory on our National Forests for years, and the more progressive lumber companies have followed this example. The removal of slash from our forests will greatly lessen the fire menace and consequently minimize the cost of an efficient system of protection.

PLATE X. Close utilization.

This company has very little unnecessary waste. Chute poles are made from inferior species, such as white fir. After logging operations are completed the chute poles are worked up for ties to be used on the logging railroad. Some companies use yellow pine for their chutes and leave the poles in the woods to rot when operations are finished. As a rule not more than one third of the lumber contained in a tree is actually utilized. There is considerable waste in the woods, in the sawmill, in the planing mill, and finally in cutting and fitting for use.

CHAPTER IV.

FOREST TAXATION.

I thoroughly believe that the present methods employed in handling our forests cannot continue indefinitely. Since their preservation, through wise use, is indispensable to our future prosperity, the practice of conservative forestry is inevitable; and timber owners must recognize that they may not handle their timber properties in such a way as to impoverish the whole State, and the State should recognize its responsibility in guarding against such a calamity, not by hysterical legislation but by practical demonstrations and by aiding owners in initiating constructive management. I want to see lumbermen practice forestry because it pays them to do so, not because public sentiment or the legislature may demand it. On the other hand, we shall see the time when timber owners must decide whether the practice of forestry on private lands shall be voluntary or not. There are two problems, however, that must be solved before the application of forestry principles will be practicable; these are forest protection and forest taxation. The latter will be discussed in this chapter.

General Property Tax.

The taxation of forests is governed by the general property tax. This is perhaps the oldest form of taxation and one wholly unadapted to forest investments. The difficulty is not so much with the amount, but with the method of taxation. It is not true that timber and timber lands in California are being excessively or unjustly taxed. There are single cases, perhaps, where taxation is a little excessive, but these are exceptions to prevailing conditions. The general property tax, if strictly enforced in its application to timber properties, would unquestionably result in excessive taxation, but it has not been and is not now being generally enforced. While the valuations of timber lands are higher in a few states (California being among them) than in the rest of the country, yet the general rule still applies. The escape from excessive taxation through lax enforcement of the law offers a gloomy outlook for the future for there is no assurance that the present haphazard easy going methods will continue indefinitely. There must be some guarantee against excessive taxation in the future before private owners can practice forestry and before investors will look favorably upon the reforesting of cut-over areas as profitable investment. The general property tax, in its application to forest investments, should be condemned because it forestalls any effort looking toward the introduction of forestry on private holdings, but not because the owners of such holdings have been bearing more than their just share of the burdens imposed upon them through taxation.

Change in Conditions.

The general property tax worked fairly well in the middle ages because the form of property was a fair index of its ability to pay taxes. It was satisfactory to the early colonists. Their property consisted chiefly of live stock, agricultural implements, visible improvements and primitive household and personal effects. The assessors had little or no difficulty in ascertaining the kind, quality and amount of wealth possessed by each citizen, and it was a simple matter to appraise it at its actual value. There lacked any opportunity for the concealment of wealth and the evasion of taxes.

The economic conditions of to-day have brought about wonderful changes. Our wealth is no longer easy to discover or easy to appraise. Vast sums of intangible property in the form of stocks, bonds and other securities can be easily concealed and escape taxation. Tax evasion is a common practice. For the most part assessments and oaths are fast becoming a farce. Lands and similar visible forms of property are the only forms of wealth that are taxed with some reasonable degree of accuracy. Consequently, timber and farm properties suffer under the general property tax because they are taxed while other forms of wealth escape.

Effects of Taxation.

In an effort to secure more equitable assessments and taxes it is frequently charged that the present system has hastened cutting, increased the waste in logging, prevented the reforesting of cut-over lands for another crop, and retarded the practice of forestry on private lands. According to data compiled by the National Conservation Commission these charges are not sustained by facts. The summary of some 500 replies to inquiries shows that these charges are not well founded. Scattered information from the states of Michigan, Wisconsin, Minnesota, Washington, and California shows that timber owners in those states believe taxation has some influence upon premature cutting, increased waste, and reforesting cut-over land.

Administration.

The administration of the general property tax in California is no better and probably no worse than in other states. County assessors are confronted with a most difficult task and I have no reason for believing other than that each is fulfilling his office to the best of his ability. For the most part they possess no technical skill or facilities for ascertaining the actual values of timber properties. With two exceptions (Lassen and Modoc) they depend upon declarations of taxpayers, hearsay evidence and occasional examinations that are necessarily superficial and inaccurate. Lack of uniformity, over and under valuations and general confusion is necessarily the result.

Out of 38 counties for which data has been compiled, only two have been cruised for assessment purposes; 12 have been roughly classified according to amount and quality of timber; 4 have been examined to some extent by the assessors; 12 examined annually; 2 are examined at irregular periods; and 11 are assessed according to previous valuations. Five counties accept the taxpayer's statement for the classification of timber and cut-over land. Siskiyou County, with nearly 700,000 acres of timber land, and Mendocino County, with over 500,000 acres, are among them.

Since the discussion on taxation of the forests should center on the method rather than the amount, I will only mention the latter. The data is rather amusing, if nothing else. For instance, the timber land in El Dorado County is assessed at a flat rate of $10.00 and cut-over land for $2.00, while the timber land in Siskiyou County is assessed from $6.00 to $7.00 per acre and cut-over land for $1.00. The former has 115,000 acres of timber land and 26,000 acres of cut-over land and the latter has nearly 700,000 and 139,000 acres respectively. Lassen County assesses timber land from $2.50 to $12.50 per acre; Plumas from $8.00 to $12.00, and Shasta from $5.00 to $10.00. The existing inequality of assessed values in the same county, and more noticeably in different counties for similar tracts of timber equally accessible or inaccessible, are unjust to timber owners, and to the county and state alike. While I have the assurance that valuations will be materially advanced in some counties and land now classified as "grazing" will be changed to "timber," it will accomplish but little toward securing a comparative equality. I believe state control offers the only solution.

Investigation Conducted.

During the winter of 1911 and 1912 a study of forest taxation was begun. Agents of the Board of Forestry gathered data from each forested county. The subject was discussed with timber owners and others familiar with and interested in taxes as applied to timber properties.

Special attention was paid to the methods employed in obtaining assessed valuations. Separate values were obtained for timber and logged-off lands. The highest and lowest assessments for each class were recorded. In addition to these data the total amount of timber and cut-over land, assessed as such, was compiled by counties, together with the total area of taxable land.

Alameda County.

There is no timber land in Alameda County. The assessor estimates that from 85 to 90 per cent of the total tax is received from incorporated cities. An actual examination of the land is made annually. In assessing orchard land, the fruit trees are not separated from the land. The assessed value of lands ranges from $4.00 to $600.00 per acre. The assessor estimates that these assessed values represent 60 per cent of the actual value. There are no regular rules for assessing. A raise is expected in assessed values this year. The tax rate in 1911 was $1.34 per $100.00 on land outside the cities. There are no sawmills in the county.

Alpine County.

There is only a small area of timber land in this county (6,033 acres). In assessing, the trees are not separated from the land. No cruises are made. The assessed value of the timber land is $3.00 per acre, and of the farm land $12.00 to $30.00 per acre. The tax rate in 1911 was $2.00 per $100.00. No raise in values is expected. There is one small sawmill in the county. The largest proportion of the total tax is contributed by farming land.

Amador County.

This county has considerable timber land. No cruises are made and the work is not systematized. The trees are not separated from the land. Timber land is assessed at $7.50 per acre, cut-over land at $2.50 to $3.00 per acre, and grazing land at $2.00 to $3.00 per acre. The tax rate on land outside of cities was $2.20 per $100.00 in 1911. The assessor estimates that the assessed value equals about 60 per cent of the actual value. An increase in the assessed values was made in 1911. The assessor is in favor of having the timber cruised.

Butte County.

This county has considerable timber land. An actual examination of the greater part is made annually, and part of the land is cruised by the deputy assessor. The timber land is divided into three classes, the first being assessed at $8.00 to $10.00 per acre, the second at $5.00 to $7.00 per acre, and the third at $2.50 to $6.00 per acre. Cut-over land is assessed at $1.25 to $2.50 per acre. The tax rate in 1911 was $2.30 per $100.00. The average actual value of the timber land was estimated to be about $24.00 per acre. There are no plans for reform in this county and the people are well satisfied with the present method of taxation.

Calaveras County.

There is considerable timber land in this county. The trees are not separated from the land, and no cruises are made. There is some talk of hiring a cruiser, but the county is afraid of the cost. The tax rate was $2.05 per $100.00 in 1911. The assessed value of timber land is $10.00 per acre, of cut-over land $1.25 to $4.00 per acre, and the chaparral land $2.50 to $5.00 per acre. The actual values are estimated at $8.00 to $20.00 per acre.

Contra Costa County.

There is no timber land in this county. The largest proportion of the total county tax is contributed by manufacturing corporations. An actual examination of the land is made annually. In taxing orchard land, the fruit trees are separated from the land. The tax rate was $1.50 per $100.00 in 1911. The average assessed value of the ranch land is estimated to be $35.00 per acre, of chaparral land $3.00 to $6.00 per acre, and of fruit trees $20.00 to $40.00 per acre. The assessor estimates the assessed value to be 60 per cent of the actual value. There are no sawmills in this county.

Del Norte County.

This county has a comparatively large area of timber land. Neither an actual examination nor a cruise of the timber is made. The assessed valuations have been raised about 60 per cent since 1906. In determining assessed values, the trees are not separated from the land. The timber land is assessed at $20.00 to $67.50 per acre, the average assessed value for spruce being $20.00 per acre, and for redwood about $35.00 per acre. It is estimated that 75 to 80 per cent of the total county tax comes from the timber lands. There are no plans of reform. Cut-over land is assessed at $3.00 to $5.00 per acre. The tax rate was $1.75 per $100.00 in 1911.

El Dorado County.

There is considerable timber land in this county. The county has no ownership plats and shows a great lack of system. The trees are not separated from the land. No examinations or cruises are made. The timber land is assessed at $10.00 per acre, which is a great increase over 1910. The cut-over land is assessed at $2.00 per acre and the chaparral land at $2.50 to $5.00 per acre. The tax rate was $2.00 per $100.00 in 1911. The assessor estimates that the assessed value equals 50 to

60 per cent of the actual value. The general sentiment in the county is in favor of securing a better knowledge of the timber resources. There are no sawmills in the county.

Fresno County.

This county has a small area of timber land. No cruises or actual examinations are made of the timber land, and the trees are not separated from the land. The timber is divided into two classes, the first being assessed at $12.50 per acre and the second at $8.00 per acre. The tax rate was $1.64 per $100.00 in 1911. Cut-over and chaparral lands are assessed at $1.50 per acre. The actual value of the timber land was estimated to be about $50.00 per acre. No plans of reform are being discussed. but the assessor is thinking of raising the assessed values.

Glenn County.

This county has a small area of timber land. No cruises are made and the trees are assessed at $2.00, $3,00, $4.00, $5.00, $6.00, $8.00 and $10.00 per acre. Cut-over land is assessed at $2.00 per acre and chaparral land at $2.00 and $3.00 per acre. The assessor estimates that the assessed value represents 60 per cent of the actual value. The tax rate in 1911 was $1.82 and $1.80 per $100.00, depending upon the school district. There was no talk of reform.

Humboldt County.

This county has a large area of timber land. No cruises are made and the trees are not separated from the land. Redwood land is assessed at $15.00 to $60.00 per acre, pine and tanbark oak land at $2.00 to $10.00 per acre. Cut-over land is assessed at $4.00 to $6.00 per acre. The assessor estimates that the assessed value equals about 50 per cent of the actual value, and that about 40 per cent of the total county tax was derived from timber land. The tax rate in 1911 was $1.90 per $100.00. The general sentiment of the county was in favor of cruising if it would not be too expensive.

Inyo County.

There is no timber land in Inyo County. The sagebrush land is valued at about $3.00 per acre and the farm land up to $100.00 per acre. The assessor estimates the assessed value to be about 60 per cent of the actual value. The tax rate in 1911 was $2.00 per $100.00. There are no sawmills in the county.

Kern County.

There is very little timber land in Kern county, and what is found is assessed at $1.33 per acre. Cut-over land is assessed at $2.00 to $12.00 per acre. The actual value of the timber land was estimated to be $2.75 to $3.00 per acre. No cruises were made. The tax rate in 1911 was $1.20 per $100.00. There is one sawmill in Kern County.

Kings County.

Kings County has no timber land. The grazing land is assessed at $2.50 per acre. The principal revenue of the county comes from the fruit lands. The fruit trees are assessed separately. Fruit and farm land is assessed at $40.00 to $100.00 per acre. The tax rate in 1911 was $1.65 per $100.00. There are no sawmill in the county.

Lake County.

This county is mostly agricultural and has very little timber land. No examinations and no cruises are made of the timber and the trees are not assessed separately. Timber land is assessed at $3.00 to $4.00 per acre, cut-over land at $2.00 to $2.50 per acre and chaparral land at $1.25 per acre. The tax rate in 1911 was $2.15 per $100.00. It was estimated that the timber land was actually worth $7.00 to $9.00 per acre. The assessor contemplates raising all the assessed values in the county.

Lassen County.

This county has a large area of timber land. In 1905, this was cruised and classified by an expert cruiser. The timber land was divided into four classes, class A being assessed at $12.50 per acre, class B at $7.50 per acre, class C at

$5.00 per acre, and class D at $2.50 per acre. The cut-over land is assessed at $2.00 per acre and the chaparral at $2.00 to $3.00 per acre. The assessor estimates that the assessed values represent about 30 per cent of the actual value. The timber land is recorded on separate plats. It was estimated that about 25 per cent of the total county tax was derived from the timber land. The assessor is contemplating raising the assessed values of the timber land. There was a flat rate of $2.50 per acre on the timber land in Lassen County previous to the cruise.

Los Angeles County.

There is no timber land in this county. In 1911 the tax rate was $1.20 per $100.00. The assessor estimated that the assessed values represent 25 to 40 per cent of the actual values. The fruit trees are assessed separately. There are no sawmills in the county. Chaparral land is assessed at $8.00 to $100.00 per acre, and fruit land up to $600.00 per acre.

Madera County.

This county has a rather small area of timber land. No cruises are made and the trees are not separated from the land. In 1911 the tax rate was $2.30 per $100.00. The assessed value of timber land was $10.00 per acre (will be $15.00 in 1912), of cut-over land was $1.50 per acre (will be $2.50 in 1912), and of chaparral $1.50 per acre. The assessor estimated that the assessed value represented about 50 per cent of the actual value.

Marin County.

The timbered area in this county is small. There are no sawmills in the county. Cruises are not made and the trees are not separated. In 1911 the tax rate was $1.55 per $100.00. The assessed value of timber land was about $9.00 per acre and for cut-over land about the same. No plans of reform were being discussed.

Mariposa County.

There is considerable timber land in this county. No cruises are made, but examinations are made at irregular intervals. The trees are not assessed separately. The timber land is divided into two classes for assessment purposes, the first being assessed at $25.00 per acre and the second at $12.50 per acre. Cut-over land is assessed at $3.50 per acre and chaparral at $3.50 to $4.00 per acre. In 1911, the tax rate was $1.70 per $100.00. It was estimated that the actual value of the timber land was about $50.00 per acre. The assessed values were raised in 1911. The assessor estimated that 25 per cent of the total county tax was derived from timber land. There were no plans of reform in this county.

Mendocino County.

The timbered area in Mendocino County is very large. No cruises and no actual examinations are made and the trees are not assessed separately. The timber land is assessed at about $10.00 per acre, the chaparral land at $2.50 per acre and the cut-over land at $2.50 per acre. In 1911 the tax rate was $2.14 per $100.00. It was estimated that the actual value of the timber land ranged from $10.00 to $100.00 per acre. No change has been made in the assessed values for nearly ten years. The timber lands probably contribute about 50 per cent of the total county tax. The general sentiment is in favor of raising the assessed values.

Merced County.

There is no timber land in Merced County. Grazing land is assessed at $4.00 per acre, and farm land at $10.00 to $100.00 per acre, and chaparral land at $1.25 to $2.50 per acre. In 1911 the tax rate was $2.15 per $100.00. There are no sawmills in the county.

Modoc County.

There is a large area of timber land in this county. A cruise of the timber was made by the county surveyor in 1908 and 1909; it was divided, for assessment purposes, into three classes. Class A is assessed at $12.00 per acre, class B at $8.50 per acre, and class C at $5.00 per acre. Cut-over land is assessed at $2.00 to $2.50 per acre. The timber lands are recorded in a separate plat book, showing the class in which each subdivision belongs. Before this cruise was made, there was a flat rate of $2.50 per acre on all timber land. It was estimated that the actual value of the timber land is from $10.00 to $50.00 per acre. The assessor estimated that about 33 per cent of the total county tax is derived from the timber land. In 1911, the tax rate was $1.60 per $100.00. The people of the county are well satisfied with the present system of taxation.

Mono County.

The timbered area in this county is small. No cruises are made and the trees are not assessed separately. Examinations are made very irregularly. The timber land is assessed at $2.50 to $3.00 per acre and the cut-over land at $1.50 to $2.00 per acre. The tax rate was $2.00 per $100.00 in 1911. The largest proportion of the county tax is derived from the grazing and farm land. The supervisors do not favor an increase in assessed values.

Monterey County.

This county has a rather small area of timber land. No cruises are made and the trees are not assessed separately. No actual examinations are made and there is a great lack of system in assessing the timber land. The timber, cut-over and chaparral lands are all assessed as grazing land at $1.25 to $4.00 per acre. The assessor estimated that the assessed values represented 45 per cent of the actual value. Fruit land is assessed at $15.00 to $225.00 per acre. There are no sawmills in the county.

Napa County.

There is no timber land in this county. The principal tax revenue comes from the ranch land. The fruit trees are not assessed separately. Examinations of the lands are made annually. Ranch and fruit land is assessed at $25.00 to $300.00 per acre, and chaparral land, which is used for grazing, at $2.00 to $5.00 per acre. The assessor estimated that the assessed value represents 50 to 60 per cent of the actual value. The tax rate was $1.76 per $100.00 in 1911. There are no sawmills in the county.

Nevada County.

The timbered area is rather small. No cruises are made and examinations are only made at irregular intervals. The trees are not assessed separately. Timber land is assessed at $2.00 to $5.00 per acre, cut-over land at $1.00 per acre, and chaparral, which is used for grazing, up to $10.00 per acre. The assessor estimates that this represents about 60 per cent of the actual value. The tax rate in 1911 was $2.50 per $100.00. There were no plans for reform.

Orange County.

There is very little timber land in this county. The trees are assessed separately. The tax rate was $1.50 per $100.00 in 1911. The principal revenue comes from the orange and walnut groves. Timber land is assessed at $17.68 per acre, and the trees at $23.32 per acre. Fruit land is assessed at $25.00 to $225.00 per acre and the fruit trees at $50.00 to $225.00 per acre. Grazing land is assessed at about $5.00 per acre. The assessor estimates that the assessed value represents 30 per cent of the actual value. There are no sawmills in the county.

Placer County.

This county has a large area of timber land. No examinations are made, but the trees are assessed separately. The timber land is assessed at a flat rate of $1.00 per acre and the trees are assessed $3.00, $4.00 or $5.00 in addition. Cut-over land is assessed at $1.00 per acre and chaparral or grazing land at $4.00 to $10.00 per acre. It was estimated that the actual value of the timber land was $20.00 to $30.00 per acre. About 15 per cent of the total county tax is derived from the timber land. In 1911, the tax rate was $2.25 per $100.00. The assessor favors cruising, but the board of supervisors voted against this proposition.

Plumas County.

There is a large area of timber land in this county. No examination and no cruises are made, but the valuations are raised from year to year. The timber land is assessed at $8.00, $10.00 and $12.00 per acre, chaparral land at $2.00 to $2.50 per acre, and cut-over land at $2.00 per acre. The tax rate in 1911 varied from $1.65 to

$2.80 per $100.00, depending upon the school district. The actual value of the timber land ranges from about $20.00 to $50.00 per acre. The assessor estimated that 65 per cent of the total tax was derived from timber land, 2 per cent from chaparral land, and about 1 per cent from the cut-over land. The present system is unsatisfactory and cruising the timber is being advocated.

Riverside County.

The timbered area in this county is small. The principal tax revenue comes from the fruit land. A four year old grove is assessed at $60.00 per acre and this is increased $30.00 per acre annually until $225.00 per acre is reached. The land and water rights are assessed separately, and the maximum valuation for the three is $500.00 per acre. The tax rate was $2.10 per $100.00 in 1911, exclusive of bonded school tax. Timber and grazing land are not separated and no examination of them is made. The assessor estimated that the assessed values represent about 30 per cent of the actual value. The present methods of taxation are unsatisfactory.

Sacramento County.

There is no timber or cut-over land in this county. An actual examination of all the land is made annually. Regular rules for assessing are in vogue. The tax rate was $1.69 per $100.00 in 1911, on land outside of cities. The assessor estimates that the assessed values represent 60 per cent of the actual value. Grazing land is assessed at $5.00 per acre, fruit and ranch lands at $15.00 to $500.00 per acre, and dredging land at $150.00 to $750.00 per acre. No plans of reform are being discussed. There are no sawmills in the county.

San Benito County.

There is very little timber land, but a great area of chaparral land in this county. In 1911, the tax rate was $1.70 per $100.00. Chaparral land is assessed at $1.00 to $2.50 per acre, cut-over land at $1.50 per acre, fruit land at $120.00 per acre, and fruit trees at $50.00 per acre. No actual examinations are made. The assessor estimates that the assessed value represents 45 per cent of the actual value. There are no sawmills in this county.

San Bernardino County.

The timbered area in this county is small, and the fruit land is the principal source of revenue. No cruises are made, but the values are raised annually to allow for growth. Timber land is assessed at $2.25 to $7.50 per acre, cut-over land at $2.00 to $3.00 per acre, fruit land at $100.00 to $350.00 per acre and fruit trees at $20.00 to $200.00 per acre. The assessor estimates that the assessed values represent 30 per cent of the actual value. The general sentiment is that the tax rate is too high and plans for reform are being discussed. In 1911 the tax rate was $2.50 per $100.00.

San Diego County.

This county has a small area of timber land, but the principal revenue comes from the fruit land. The tax rate was $2.00 per $100.00 in 1911. The forest trees are not assessed separately. The timber land is assessed at about $1.50 per acre, chaparral land at $3.00 to $5.00 per acre and fruit trees at 30 cents per tree. The assessor estimates the assessed value to be 30 per cent of the actual value. There is one small sawmill in the county.

San Joaquin County.

There is no timber land in this county, and the greater part of the revenue is contributed by the farm land. Ranch land is assessed at $10.00 to $300.000 and up to $1,000.00 per acre, in a few cases. Grazing or chaparral land is assessed at about $3.00 per acre. The assessor estimates the assessed values to be about 50 per cent of the actual value. There are no sawmills in the county.

San Luis Obispo County.

There is very little timber in this county. Apple and walnut lands are assessed at about $200.00 per acre for walnut land and $6.00 to $8.00 per acre for apple land. The assessor estimates the assessed values to be 25 per cent of the actual value. The tax rate in 1911 was $2.11 per $100.00. Chaparral and oak land is classified as grazing land and assessed $1.25 per acre. There are no plans for reform and no sawmills in the county.

San Mateo County.

There is a small area of timber land in this county. No cruises and no examinations are made. Timber land is assessed at $8.00 to $12.00 per acre, cut-over land at $2.00 to $5.00 per acre, and chaparral land at $2.00 to $50.00 per acre. The tax rate in 1911 was $1.85 per $100.00. No plans of reform were being discussed. There are four sawmills in the county.

Santa Barbara County.

There is no timber in this county, but there is a big area of chaparral land, which is assessed at $1.25 and $1.30 per acre. The tax rate was $2.34 and $2.74 per $100.00 in 1911. The general sentiment is that the present system is satisfactory.

Santa Clara County.

There is no timber land, but a great deal of chaparral land in this county which is assessed at $1.50 to $5.00 and up to $10.00 per acre in some cases. The tax rate in 1911 was $1.35 per $100.00. There are no sawmills in this county and no plans for reform.

Santa Cruz County

Two thirds of the timber land in this county has been cut over and is now considered as chaparral land. In 1911 the tax rate was $2.10 per $100.00. Chaparral land is assessed at $2.00 to $5.00 per acre, cut-over land at $5.00 to $8.00 per acre, timber land at $10.00 to $50.00 per acre, fruit land $50.00 to $200.00 per acre, and 25 cents to $1.75 each for fruit trees. The assessor estimates that the assessed value represents about 45 per cent of the actual value. No examinations and no cruises are made. The general opinion is that the assessed values of the timber land are too high. There are four sawmills in the county.

Shasta County.

There is a large area of timber land in this county. Examinations are made at irregular intervals and some cruising is done. The trees are not assessed separately. The timber land is divided into four classes which are assessed as follows: Class 1 at $10.00 per acre; class 2 at $8.00 per acre; class 3 at $5.00 per acre and class 4 which is cut-over land, at 50 cents to $2.00 per acre. Chaparral land is assessed at $1.25 to $2.50 per acre. It was estimated that 25 per cent of the total county tax is derived from the timber land and 8 to 10 per cent from the chaparral and grazing land. The actual value of the timber land ranges from about $16.00 to $60.00 per acre. The tax rate was $2.24 per $100.00 in 1911. The assessor is in favor of cruising the timber.

Sierra County.

The area of timber land in this county is large. No cruises are made and actual examinations are only made in case of doubt. The trees are not assessed separately. Timber land is assessed at $2.50 to $6.00 per acre and cut-over land at $1.00 per acre. Proportional reductions are made when part of an area is cut over. The tax rate was $2.00 per $100.00 in 1911. It was estimated that the average actual value of the timber land is about $25.00 per acre and of the cut-over land about $2.50 per acre. No plans for reform were being discussed.

Siskiyou County.

There is a very large area of timber land in this county. The trees are not assessed separately and neither cruises nor actual examinations are made. Timber land is assessed according to accessibility at $6.00 and $7.00 per acre, and cut-over land at $1.00 per acre. In 1911 the tax rate was $2.00 per $100.00. It was estimated that 65 per cent of the total tax is derived from timber land, 15 per cent from chaparral, desert and grazing land, and 5 per cent from the cut-over land. Chaparral land is assessed at $2.50 per acre. The general sentiment favors cruising. There are fifty-two sawmills in this county.

Solano County.

There is no timber land in this county. The principal tax revenue comes from the fruit and ranch land. An actual examination is made each year. The tax rate in 1911 was $1.60 per $100.00. Land is assessed at $10.00 to $300.00 per acre, and fruit trees at $40.00 per acre. The assessor estimated that the assessed values represent 60 to 70 per cent of the actual values. There are no sawmills in the county and no plans for reform.

Sonoma County.

There is a large area of timber land in this county. No cruises are made and the trees are not assessed separately. An actual examination is made every four years. The oak land is assessed at $3.00 per acre, redwood at $8.00 to $50.00 per acre, cut-over land at $4.00 to $5.00 per acre and chaparral at $2.00 per acre. The assessor estimates that the assessed values represent 30 to 50 per cent of the actual value, and believes this to be high enough. In 1911 the tax rate was $1.60 per $100.00. The principal revenue in this county comes from farm land.

Stanislaus County.

There is no timber land in this county; also there are no sawmills. The principal tax revenue comes from ranch land. The tax rate was $1.85 per $100.00 in 1911.

Sutter County.

There is no timber land in this county; also no sawmills. Examinations of the land are made yearly. Pasture land is assessed at $2.50 to $10.00 per acre. The tax rate in 1911 was $1.50 per $100.00. The present system of taxation is satisfactory to the people.

Tehama County.

This county has a large area of timber land. No cruises nor examinations are made and the trees are not assessed separately. The timber land is divided into four classes, which are assessed as follows: Class 1 at $3.00 per acre, class 2 at $5.00 per acre, class 3 at $8.00 per acre and class 4 at $10.00 per acre. Cut-over land is assessed at 50 cents to $2.00 per acre, and chaparral at $1.50 to $2.50 per acre. The average actual value of the timber land is estimated to be about $19.00 per acre. The people seem fairly satisfied with the present methods, but the general sentiment favors cruising.

Trinity County.

This county has a large area of timber land. No cruises and no examinations are made. The trees are not assessed separately. Timber land is assessed at $5.00, $8.00 and $10.00 per acre, very poor timber land is assessed at $2.50 and $3.00 per acre, cut-over land at $1.00 per acre and chaparral at $1.00 to $1.50 per acre. The actual value of the timber land is estimated to be from $10.00 to $20.00 per acre. In 1911 the tax rate was $2.60 per $100.00. The assessor estimates that the timber land contributes 50 per cent and the chaparral land 10 per cent of the total tax. The general sentiment of the county is in favor of cruising.

Tulare County.

This county has a rather large area of timber land. The trees are not assessed separately. No examinations and no cruises are made. Timber land is assessed at $2.50 to $30.00 per acre, cut-over land at $1.50 per acre and grazing and chaparral land at $2.50 per acre. The assessor estimates the assessed values to be about 50 per cent of the actual value. The tax rate was $1.70 per $100.00 in 1911. There were no plans for reform.

Tuolumne County.

There is a rather large area of timber land in this county. No cruises or examinations are made. The trees are not assessed separately. Ordinary timber land is assessed at $10.00 per acre, "Big Tree" tracts at $80.00 per acre, cut-over land at $2.00 per acre and chaparral land at $1.25 to $3.25 per acre. The actual value of the ordinary timber land is estimated to be about $18.00 per acre. The tax rate in 1911 was $1.95 per $100.00. There were no plans for reform.

Ventura County.

There is very little timber land in this county. Most of the revenue comes from the fruit lands. Fruit land is assessed at $250.00 to $300.00 per acre, and fruit trees at $1.00, $2.00 and up to $4.00 each. The tax rate in 1911 was $1.70 per $100.00. The timber is only used locally and there is no systematic method for determining the valuation of timber land.

Yuba County.

This county has considerable timber land. No cruise and no examinations are made, but the assessed values are determined by the general knowledge of the assessor. Timber land is assessed at $5.00 per acre, cut-over land at $2.00 per acre, and chaparral and grazing land at $2.00 per acre. The tax rate in 1911 was $2.40 per $100.00. There were no plans for reform.

It is apparent that satisfactory and uniform assessed values of timber properties can not be secured by the methods now employed. It is unjust — viewed alike by owners and counties. While timber cruising is expensive, it is nevertheless the only way to determine the amount of timber on different holdings, which is the principal factor, other things being equal, in arriving at equitable values.

In some of the timbered counties the revenue derived from forest taxes forms a large percentage, and frequently the timbered area exceeds 25 per cent of the assessable land area. The estimated percentage of assessed value to true value is often very low; whether it is lower in proportion to ranch and range land remains to be determined.

A summary of the data obtained for the several counties is shown in the following table:

TIMBER AREA AND ASSESSED VALUATION.

County.	County assessors' methods for determining valuation of timbered and cut-over lands.	Assessed valuation per acre.				Estimated per-cent of true value.	Forest land privately owned.		Taxable land.			Estimated per cent of county tax derived from timber lands.	Tax rate per $100.00, 1911.
		Timber land.		Cut-over land.									
		Lowest.	Highest.	Lowest.	Highest.		Timbered acres.	Cut-over acres.	Total area acres.	Per cent timbered.	Per cent cut-over.		
Alameda													
Alpine	Examination	$3 00	$3 00				3,460	2,573	44,942	7.6	5.7		$2 00
Amador	Owner's statement	7 50	7 50	$2 50	$3 00	60	22,770	2,490	277,490	8.2	0.8		2 20
Butte	Classification	2 50	10 00	1 25	2 50	30—50	86,417	72,952	893,198	9.6	8.0		2 30
Calaveras	Examination	10 00	10 00	1 25	4 00	50	68,668	3,080	499,752	13.7	0.61		2 25
Colusa													
Contra Costa													
Del Norte	Classification	20 00	67 50	3 00	5 00	40—50	111,680	4,600	219,881	50.7	2.0	75—80	1 75
El Dorado	Previous assessment	10 00	10 00	2 00	2 00	50—60	114,976	26,074	655,674	17.5	3.9		2 00
Fresno	Classification	8 00	12 50	1 50	1 50	20	21,408	44,840	2,127,134	1.0	2.1		1 64
Glenn	Classification	2 00	10 00	2 00	2 00	60	27,387	718	632,148	4.3	0.11	5	$1 80 and 1 82
Humboldt	Classification	2 00	60 00	4 00	6 00	50	481,900	65,120	1,621,619	29.7	4.0	40	1 90
Imperial													
Inyo													
Kern	Annual examination	1 33	1 33	2 00	12 00	50	4,760	5,040	3,105,141	0.1	0.16		1 20
Kings													
Lake	Previous assessment	3 00	4 00	2 00	2 50	40—50	6,460	3,060	361,069	1.7	0.8		2 15
Lassen	Cruising	2 50	12 50	2 00	2 00	30	215,414		738,554	29.0		25	
Los Angeles													
Madera	Previous assessment	10 00	10 00	1 50	1 50	50	22,876	3,720	744,706	3.0	0.4		2 30
Marin	Examination	9 00	9 00	9 00	9 00		18,173	16,441	321,182	5.6	5.1		1 55
Mariposa	Classification	12 50	25 00	3 50	3 50	40—50	85,718	7,200	318,534	11.2	2.2	25	1 70
Mendocino	Owner's statement	10 00	10 00	2 50	2 50	10—100	532,528	187,348	1,602,866	33.2	8.5	50	2 14
Merced													
Modoc	Cruising	5 00	12 00	2 00	2 50	30—50	259,562	440	631,538	41.0	0.06	33	1 60
Mono	Irregular examination	2 50	3 00	1 50	2 00		15,320	8,520	164,210	9.3	5.1		2 00
Monterey	Previous assessment	1 25	4 00	1 25	4 00	45	87,073	6,680	1,446,496	6.0	0.4		1 55
Napa													
Nevada	Irregular examination	2 00	5 00	1 00	1 00	60	57,621	96,269	486,984	11.8	19.7		2 50
Orange													
Placer	Previous assessment	4 00	6 00	1 00	1 00		149,189	116,789	718,700	20.7	16.2	15	2 25
Plumas	Owner's statement	8 00	12 00	2 00	2 00	30—40	236,595	14,918	541,687	43.6	2.7	65	$2 05 and 1 65 2 80 and 2 60
Riverside	Previous assessment	2 18	2 18			30	5,820	6,047	1,219,236	0.4	0.4		2 00
Sacramento													

San Benito	Previous assessment			1 50	1 50	45	2,960	1,240	592,263	0.4	0.2		1 70
San Bernardino	Classification	2 25	7 50	2 00	3 00	30	10,940	15,090	1,881,487	0.79	1.09		2 50
San Diego	Previous assessment	1 50	1 50			30	23,140		1,179,782	1.9			2 00
San Francisco													
San Joaquin													
San Luis Obispo	Previous assessment	1 25	1 25			25	2,040		1,018,012	0.20			2 11
San Mateo	Previous assessment	8 00	12 00	2 00	5 00		23,880	1,940	307,452	7.7	0.6		1 85
Santa Barbara													
Santa Clara													
Santa Cruz	Previous assessment	10 00	50 00	5 00	8 00		18,169	43,866	258,599	7.0	16.9		2 10
Shasta	Classification	5 00	10 00	50	2 00		426,895	29,240	1,442,723	29.5	2.0	25	2 24
Sierra	Examination	2 50	6 00	1 00	1 00	20—30	137,406	40,092	323,048	42.2	12.4		2 00
Siskiyou	Owner's statement	6 00	7 00	1 00	1 00		694,363	139,196	1,836,237	37.8	7.5	65	2 00
Solano													
Sonoma	Classification	8 00	50 00	4 00	5 00	30—50	163,488	60,523	899,782	18.1	6.7		1 60
Stanislaus													
Sutter													
Tehama	Classification	3 00	10 00	50	2 00	50	99,337	63,216	1,291,757	7.6	4.8		
Trinity	Classification	5 00	10 00	1 00	1 00	50	256,808		570,985	44.9		50	2 60
Tulare	Owner's statement	2 50	30 00	1 50	1 50	50	39,748	1,290	1,798,939	2.2	0.07		1 70
Tuolumne	Classification	10 00	80 00	2 00	2 00	60	130,968	19,400	460,815	28.4	4.2		1 95
Ventura													
Yolo													
Yuba	Previous assessment	5 00	5 00	2 00	2 00	7	20,600	25,884	402,677	5.1	6.4		2 40

Letters from Lumbermen.

During the winter of 1911-1912 the following questions, among others, were sent to representative lumbermen throughout the State:

1. Do you consider the present tax on timber lands excessive?
2. Would you suggest reform; if so, of what description?
3. Would you consider it feasible, for purposes of taxation, to separate the land from the timber, taxing the first annually, and the latter when cut?

Thirty-three replies were received, giving some valuable testimony as to how the lumbermen of this State regard the present system of taxation of forest land.

The answers to the first question may be classified as follows:

Answers to question 1.	
1. No information	17
2. Present tax believed to be excessive	5
3. Present tax not considered excessive	11
Total	33

Some interesting reasons were given as to why the present tax was considered excessive:

Case 1. Considered it fair as compared with what other taxpayers have to pay, but believed there is a chance for more economy in public expenditures.

Case 2. Believed the tax to be excessive for the reason that the crop is harvested but once, and the increase in stumpage has not been sufficient to take care of the increased taxes and the interest on the investment.

Case 3. Considered that taxes are growing much faster than timber values.

Case 4. Considered it excessive on the grounds that the timbered portion is inaccessible in his locality, and the cut portion unsalable and the whole unproductive, and a bill of expense for twenty years.

Case 5. Believed the tax to be excessive for the reason that the land has only a nominal value and is assessed at a proportionately higher rate than other property in the same county.

No reasons were given as to why the present tax was not considered excessive, but one lumberman qualified his reply with the remark that while he did not consider the tax excessive, he did not feel justified in buying more timber lands because of it.

The replies to question 2 may be classified as follows:

Answers to question 2.	
No information	19
No reform suggested	5
Favor reform, but have no definite suggestions	1
Have definite plans for reform	8
Total	33

In the replies in which no reform was suggested, no reasons were given by most, while a few expressed themselves as satisfied with the present system. One lumberman was opposed to reform because he believed that conditions will adjust themselves to almost any system of taxation in time. He stated that he is opposed to continual changing.

The following are a few of the plans for reform that were advanced by the lumbermen in their replies:

Case 1. Several expressed themselves as being in favor of either carrying the cut-over land that will reforest itself at a nominal valuation, or else to eliminate it from taxation entirely.

Case 2. Standing timber should not be taxed at all, as it encourages enormous waste.

Case 3. To increase the tax on manufactured lumber and reduce it on standing timber.

Case 4. A uniform taxation for all counties in the State, based upon character and quality of timber and accessibility to transportation, and the assessment of absentee owners on the same basis as resident owners.

Case 5. One lumberman, who has made an exhaustive study of forest taxation, writes that in his opinion the best and most satisfactory system of taxing our forests will be to assess them when the timber is cut. He states that under the present tax laws it is quite impossible to carry on reforestation successfully on an economical basis.

Case 6. Sent by one of the lumbermen's associations. The State should establish a sort of revolving fund, entirely exempting timber lands, after proper classification.

from taxation, but heavily taxing the product when it is cut and before it is removed from the land. These receipts from the lumbering operations are to be made into a fund in charge of the State, to be distributed annually among the timber counties according to their needs, crediting the counties with the money they have paid in and charging them with that paid to them, with the idea that in the long run matters will be evened up. It is their idea that such a method would encourage reforestation.

The answers to question 3 may be classified as follows:

Answers to question 3.	
No information	17
Considered feasible	6
Not considered feasible	10
Total	33

Two reasons were advanced as to why this plan was considered feasible. One was that this method would tend greatly to the conservation of timber, and the other was that by this method the taxes might be made equitable and just.

Of those who did not consider this plan feasible, Case 1 believed that a low value, placed on the land and timber together, would be preferable, for the reason that it would give a revenue to the county in which the timber land was located. Case 2 thought that standing timber should be taxed with its land and not separated. Case 3 did not believe it feasible for the reason that the land alone is worth practically nothing, while it is worth $100.00 to $150.00 per acre with its timber.

Conclusions.

It is obvious from these replies that the views expressed by the timbermen are far from being uniform. Many of them have given very little thought to the subject of forest taxation, and consequently were unable to give any expressions of opinion. The larger holders, however, have given a great deal of study to this taxation problem and many definite plans for reform were presented. The majority of these men were unanimous in declaring that the present system of taxation is unsatisfactory and that some reform is needed. While, in many cases, the present taxes were not considered excessive, the lack of uniformity and the uncertainty under the present system that the future taxes would not be made excessive were regarded as being prohibitive against the growing of future crops. No man will engage in such a long-time investment without some knowledge of what his expenses are to be, for nothing deters an investor so much as uncertainty of the costs. Moreover, he may pay taxes for forty or fifty years, only to see his entire holdings wiped out by fire with the result that his investment is a total loss.

Taxation in Other States.

Inquiries were made of secretaries of states, state foresters and forest schools throughout the country in order to find out what the other states are doing in regard to the taxation of timber lands. In all, 62 replies were received.

The results of these inquries may be classified as follows:

1. Number of states that have made no study of forest taxation	19
2. Number of states that have made a study of forest taxation	17
3. Number of states that contemplate making such a study	4
4. Number of states that have legislation concerning forest taxation	15

Forest Tax Laws.

The forest tax laws passed by other states may be put into three general classes: 1st, bounties; 2d, rebates; and 3d, exemption of a part or all of the area held by an owner for a period of years.

(1) *Bounties.*

Minnesota, Kansas, Massachusetts, Wyoming, Wisconsin, and Illinois are the States in which bounties are offered. These bounties are either in the form of competitive prizes for the best plantations or they are paid for each acre which is planted according to the provisions of the State.

So far as can be ascertained, Minnesota is the only State that has secured any results by this method. It has been estimated that 50,000 acres have been planted under this law, in Minnesota, at a cost of $440,000. It is obvious that this cost will be prohibitive when applied to the great areas of cut-over lands such as we have in California.

The Wyoming law is given in full below as a type of bounty law.

Wyoming Revised Statutes.

> Section 2645. It shall be lawful for the board of county commissioners in any county in this State to offer a bounty to any person in said county who shall hereafter plant one or more acres of land with forest trees and properly cultivate the same for five years for each acre so planted and cultivated; *provided*, that trees so planted shall not be at a greater distance than ten feet apart each way and shall be kept in a live, thrifty condition for at least five years after being planted before said bounty shall be due and payable; *and provided, further*, that the provisions of this act shall not apply to any lands held as timber culture entries under any of the timber laws of the United States.
>
> Section 2646. The board of county commissioners desiring to offer the bounty herein provided for, shall do so by resolution to be made of record and giving notice in some newspaper published in the county three weeks prior to the first day of April of each year, said resolution and notice to state the amount of bounty offered for each acre planted and cultivated.
>
> Section 2647. Any person claiming the bounty under this chapter shall make proof before the county commissioners that he has complied with the provisions of section 2645, and that the trees planted by him are in a healthy and growing condition.
>
> Section 2648. Upon satisfactory proof of the compliance with this chapter, the board of county commissioners may issue to the person entitled thereto a warrant upon the county treasurer as in other cases, for the amount due under the offer made by the board.

(2) *Rebates.*

Pennsylvania and New Hampshire have tried offering rebates of a portion of the taxes. Their method consists of assessing timber lands at their sale value, but offering under certain restrictions, a rebate upon taxes paid. In New Hampshire, the law has only been in force since 1903, and enough time has not elapsed for a thorough trial. However, very few have availed themselves of the privileges, thus far. This method has been in force in Pennsylvania for over twenty years, but with very little result, and in 1905 the laws were redrafted and reënacted. The Pennsylvania laws, as reënacted, are given below, although their value cannot be said to be fully determined.

ACT No. 88.

To encourage the preservation of forests, by providing for a rebate of taxes levied upon forested land.

SECTION 1. *Be it enacted, etc.* That in consideration of the public benefit to be derived from the retention of forest or timber trees, the owner or owners of land in this commonwealth, having on it forest or timber trees averaging not fewer than fifty trees to the acre, each of the said trees to measure at least eight inches in diameter, at a height six feet above the surface of the ground, with no portion of the said land absolutely cleared of the said trees, shall, upon filing with the assessors of their respective townships or districts, annually, an affidavit made by some one in his, her or their behalf, upon blanks to be provided by the county commissioners of the respective counties, and by them to be furnished to the assessors for the purposes herein intended, setting forth the number of acres of timber land within the requirements of this act, be entitled to receive annually, during the period that the said trees are maintained in good condition upon the said land, a rebate equal to eighty per centum of all taxes, local and county, annually assessed and paid upon said lands or so much of the eighty per centum as shall not exceed in all the sum of forty-five cents per acre; the said rebate to be deducted from said taxes pro rata, and receipted for by the respective tax collectors or county treasurers; *provided, however*, that no one property owner shall be entitled to receive said rebate on more than fifty acres.

SEC. 2. It shall be the duty of the assessor, when such affidavit is filed with him, to record upon his assessment book the amount of timber land upon which the owner or owners may be entitled to receive the rebate, together with the value at which such timber land shall be assessed, for the purpose of furnishing the necessary information to those who shall prepare the respective tax duplicates, and upon which duplicate the amount of the said rebate shall be stated. No additional compensation shall be allowed any assessor for performing the duties required by this act. It shall likewise be the duty of each assessor, after receiving such affidavit, to file the same, with the county commissioners of the respective counties.

SEC. 3. The following acts of assembly, to wit: "An act for the preservation of forests, and partially relieving forest lands from taxation," approved May twenty-five, one thousand eight hundred and ninety-seven (Pamphlet Laws, 77), and all other acts or parts of acts inconsistent with the subject matter covered by this act, be and the same are hereby repealed.

Approved the eighth day of April, A. D. 1905.

ACT NO. 179.

To encourage the planting and the maintaining of sprout forest and timber trees, and providing that those who thus aid shall be exempt from taxation; defining the duties of the township assessor of taxes and penalties for violation of this act.

SECTION 1. *Be it enacted, etc.* That in consideration of the public benefit to be derived from the planting and cultivation of forest or timber trees, the owner or owners of any land in this commonwealth who shall plant the same with forest or timber trees, in number not less than three hundred to the acre, shall have a rebate in his, or her, or its taxes, to the amount of eighty per centum thereof, thereon, for a period of thirty-five years; *provided*, that such rebate shall not amount to more than forty-five cents per acre, said period of exemption to be counted from the time the said land or lands shall have been planted with forest or timber trees, as aforesaid, or from the time it may have been necessary to replant the same, as aforesaid, by reason of destruction from fire; and the rebate herein provided for shall be calculated and allowed by the tax collector.

SEC. 2. The owner or owners of any land or lands in this commonwealth who shall maintain upon said land or lands sprout forest or timber trees, in number not less than three hundred to an acre, shall be entitled to and receive the rebate of taxes as provided in section one; said period of exemption to be counted from the time the said land or lands shall have been so maintained with sprout forest or timber trees, or from the time that said sprout forest or timber trees may have been destroyed by fire.

SEC. 3. Upon any tract or tracts selected as a forest reservation, in accordance with sections one and two of this act, which contain fifty or less original forest trees on each acre, the owner or owners may plant a sufficient number of trees which shall make up not less than the required three hundred trees to the acre, and the same become subject to this act, in accordance with sections one and two.

SEC. 4. No land owner or owners shall receive the benefit of this act who shall permit cattle, horses, sheep, hogs, or goats to pasture upon such reservation or reservations, until at least two hundred trees upon each acre of said tract are four or more inches in diameter two feet from the surface of the ground.

SEC. 5. It shall be the duty of the township assessor of taxes to personally examine the various forest reservations, and, if found necessary, to demand of the owner or owners, or their agent thereof, to subscribe, under oath, that the land is maintained under the conditions of this act; and to return to the county commissioners the number of acres so maintained and the time from which the land has been so maintained; and also to make a duplicate return of the same data to the state forestry commission.

SEC. 6. Any assessor who shall knowingly and wilfully accept and make a fraudulent return or any owner or agent who shall knowingly and wilfully make any fraudulent return to the assessor, shall be liable to a fine of not more than five hundred dollars, or imprisonment of not more than one year, or either or both, at the discretion of the court; *provided, however*, that the provisions of this act shall not be construed so as to exempt from taxation more than five hundred acres, owned by any one person or body corporate, or limited copartnership or association.

All acts inconsistent with this act are hereby repealed.

Approved the twentieth day of April, A. D. 1905.

(3) *Exemption.*

Colorado, Connecticut, Indiana, Maine, Massachusetts, Nebraska, New Hampshire, Rhode Island, Vermont, and Wisconsin have laws which exempt a portion or all of young forest plantations for a period of years. Almost no results have been reported from these laws. This is probably due in part to certain very important defects in these laws.

The restriction of this exemption to plantations, and in several States, to land other than woodland, in a large measure destroys its usefulness at the very beginning. To give good results, these laws must be drawn so as to include young stands produced by natural reproduction. In several of the States, the number of trees required per acre is too large, while the number of species permitted is too small. Often, the proper care of the trees and the most profitable management of the stand is interfered with by the requirements of the law.

The period of the tax abatement is not long enough to make the financial consideration sufficient to act as much of an inducement to the owner. It generally comes at a time when the plantation has little value, and the remission of taxes is small when compared to the expenses involved in preparing the land and planting the trees. By the time the trees are large enough to have any real value the period of tax exemption has elapsed and the land and trees are again subject to the general property tax.

The framers of these laws have placed the whole burden of the tax redemption upon the particular locality in which the plantation is located. The advantages from these plantations are derived by the State in general, but under these laws, whatever is gained by the timber owner must be made up by heavier assessments upon the other local owners.

The Rhode Island law, as amended in 1908, is hereby given below as a type of exemption law.

Chapter 1581, Laws of 1908.

An act in amendment of section 3 of chapter 44 of the General Laws, entitled "Of Property Liable to and Exempt from Taxation."

It is enacted by the general assembly as follows:

SECTION 1. Section 3 of Chapter 44 of the General Laws is hereby amended so as to read as follows:

"Section 3. Whenever there shall have been planted one or more acres of land worth not more than twenty-five dollars per acre in the State, to trees of any of the following kinds: chestnut, hickory, oak, maple, larch, pine, ash, catalpa, locust, basswood, beech, hemlock, spruce, tulip tree, cedar, sycamore and walnut in numbers not less than five hundred to the acre, the owner of such plantation of trees may file with the tax assessors in any town in which such plantation may be located an affidavit showing that he has complied with the requirements of this act.

"Upon such proof, such plantation, including the trees and land on which they are growing in good condition, shall be exempted from all taxation whatsoever for a period of fifteen years, said period of exemption to be counted from the time the said land shall have been planted as aforesaid, or from the time it may have been necessary to replant the same, by reason of destruction by fire, if the same shall be replanted within one year after such destruction; *provided,* said land is planted or replanted, as the case may be, and managed under a forest working plan approved by the state commissioner of forestry during said period of exemption from taxation; *provided, further,* that the provisions of this act shall not be construed so as to exempt from taxation more than three hundred acres owned by any one person, corporation, limited copartnership, or association."

SEC. 2. This act shall take effect upon its passage, and all acts and parts of acts inconsistent herewith are hereby repealed.

Legislation.

It seems apparent from the foregoing that laws providing for rebates, bounties, prizes or exemptions have accomplished but little toward the practice of forestry. They all fail in that they do not provide for a different method of taxing forest properties. Legislation in our own State should be carefully thought out and planned with a view of making it possible to grow crop after crop of timber. Much study of this problem is necessary before proper legislation can be suggested. Those who have devoted much attention to forest taxation are of the opinion that the forests should be taxed when they are cut: when they yield a revenue with which to pay. No such laws have been passed by any State, consequently no assistance, based upon the operation of such a law, can be secured.

A systematic study of the taxation problem should be continued. If, during the investigation, it is found that timber is being cut because the present owners have not sufficient capital to pay the taxes, then an emergency measure might very properly be passed to cover such cases. Deferred tax certificates, bearing 6 per cent interest, could be issued to the owner by the county assessor upon application. Any legal subdivision could be released for cutting, by giving thirty days' notice, after the interest and accrued taxes have been paid. This plan has been suggested by Mr. George M. Cornwall, editor of *The Timberman*. Mr. Cornwall has done much toward furthering the cause of forestry and his plan seems adapted to practical application.

CHAPTER V.

STATE FORESTRY DEPARTMENTS.

ORGANIZATION AND APPROPRIATIONS.

That the legislators, and the public generally, may be fully informed of what other States are doing to conserve and preserve their timber resources, an investigation has been made of the organization and appropriations of such States as are practicing forestry. In some States a good beginning has been made, and an adequate working capital has been provided.

An effort has been made to keep the forestry departments as free from political influences as possible. Every phase of this great movement is new; the work is both investigative and creative and its ultimate success depends largely upon the officers' familiarity with forest conditions in his State. The problems are as intricate as they are numerous. Much time is required to gain a thorough working knowledge of field conditions and of the problems affecting different interests and localities. Frequent changes in administration are detrimental to the solution of problems that oftentimes require years of patient study and observation.

Twenty-two States and one territory have recognized the importance of forestry. The tendency is to improve the stronger ones and to strengthen the weaker ones by better legislation and increased appropriations.

Massachusetts spends $295,000 annually for the protection, extension, and solution of her forest problems, but her timbered area is only 2,000,000 acres.

New York spends $266,800 and her forested area is 12,000,000 acres.

Pennsylvania has a forested area of 9,200,000 acres and spends $280,250 annually.

Wisconsin with her 16,000,000 acres of forested lands spends $137,100 annually.

And what does California appropriate for her 24,000,000 acres of forested land? Just $15,150 annually.

The following summary shows what each State has done to conserve her timber resources:

Alabama.

In 1907, a State Commission of Forestry was created, consisting of the Governor; a member of the State Tax Commission; the State Game and Fish Commissioner; the Commissioner of Agriculture and Industries; one practical lumberman engaged in the manufacture of lumber in the State, who is appointed by the Governor to serve for a term of five years; a member of the United States Forest Service, recommended by the Forester of the said Forest Service; and the Professor of Forestry in the Alabama Polytechnic Institute.

The members of this commission receive no compensation. Five hundred dollars ($500.00) is appropriated annually for the purpose of carrying out the provisions of the forestry acts and for the payment of the incidental expenses of the Commission of Forestry. All sheriffs, deputy sheriffs, constables, marshals, justices of the peace and other peace officers of the State are declared ex officio deputy forest wardens and are required to enforce all forest laws of the State. Deputy forest wardens who serve without compensation are also appointed by the Governor, on the recommendation of the Commissioner of Forestry.

California.

The California State Board of Forestry is composed of the Governor, Secretary of State, Attorney General and the State Forester. The State Forester is appointed by the Governor. His term of office is during the pleasure of the Governor. The Deputy State Forester and the Assistant State Forester are appointed by the State Forester and hold office during his pleasure. The biennial appropriation for forestry is $30,300. This is divided as follows: Salaries, $12,800; support, $15,000; and printing, $2,500. The salaries of the State Forester, his deputy and assistant are paid from the salary fund and are fixed by statute as follows:

State Forester, $3,000 a year; Deputy State Forester, $1,800 a year; and Assistant State Forester, $1,600 a year. The firewardens are voluntary and are appointed by the State Forester.

Connecticut.

Appropriations in this State are made for biennial periods by the general Assembly, which convenes in odd years. The forestry work centers in the Agricultural Experiment Station. The forester of the station is, by law, State Forester and ex officio State Forest Firewarden. His salary and that of the Assistant State Forester is paid by the Agricultural Experiment Station, and both of these officials are appointed by the Board of Control of the Experimental Station. The salary of the State Forester is $2,500 a year, and of the Assistant State Forester $1,500. Town and district firewardens receive 35 cents per hour, and assistants or laborers at forest fires receive 20 cents per hour. Pay of patrolmen cannot exceed $2.50 per day. The biennial appropriation for maintenance and general expenses is $3,000; for the purchase of state forests, $5,000; and for the forest firewarden $3,000. This latter appropriation covers the traveling and other expenses of the State Forester in connection with firewarden duties and one quarter of the expenses of the towns in extinguishing fires. Besides this, the office is provided annually with a budget of approximately $7,000 by the experimental station. From this budget, the salaries of the State Forester and Assistant State Forester as well as the expenses of the experimental station work in forestry are paid. This work has chiefly been connected with the nursery and planting experiments and educational work.

Hawaii.

The Division of Forestry is a branch of the Territorial Board of Agriculture and Forestry. The members of the Board of Commissioners of Agriculture and Forestry are unpaid, but provision is made for the payment of their traveling expenses. The Superintendent of Forestry, who is also ex officio Chief Firewarden, has a statutory salary of $3,000 per annum. His assistant, who holds the title "Forest Nurseryman," receives $1,800 per annum. Since 1909, all the expenses of the board of Agriculture and Forestry have come from the conservation fund, raised by special immigration conservation income tax. This has been turned over in a lump sum at the rate of about $3,500 a month. Of this sum, the total allotment to the Division of Forestry has been about $14,000 per year.

Indiana.

The Indiana State Board of Forestry consists of a secretary and four other members. The salaries are fixed by statute as follows: Secretary of board, $1,800; stenographer to secretary, $600; four board members, $400; mileage of four board members. $58.28; general office expense and mileage, $1,000, making a total of $3,858.28. Besides this an appropriation of $3,000 a year is made for the Forest Reservation and Experimental Station. The legislature convenes biennially but this appropriation is annual.

Kentucky.

The State Board of Forestry in Kentucky consists of six members; namely, the Governor, the Director of the Experimental Station, the Commissioner of Agriculture, who are ex officio members, and three others, who are appointed by the Governor. The members of the board receive no compensation, except actual expenses incurred in the performance of their duties. The State Forester is appointed by the board for a term of four years. His salary is fixed by the State Board of Forestry at a sum not to exceed $2,500 per annum, and his traveling and field expenses. An annual appropriation of $15,000 is made to cover all forestry expenses, including salaries. The forest wardens are paid a sum not exceeding $2.00 per day for each day of services. They are commissioned by the Governor on the application of the State Board of Forestry, and are paid out of the general appropriation.

Louisiana.

The registrar of the land office is ex officio forester. He receives a salary of $500 and has an expense fund of $300 per annum. The deputy forester is appointed by the Governor, on recommendation of the Conservation Commission, for a period of one year at a time. He receives a salary of $1,800 per annum and has an allowance of $600 per year for office and traveling expenses, which is paid out of the conservation fund. This fund is derived from an annual license tax upon all persons, business firms and corporations pursuing the business of severing timber and minerals from the soil. This fund amounts to from $50,000 to $75,000 per annum, and the greater portion is expended for care and protection of the forests.

Maine.

In this State the land agent is also forest commissioner and the chief clerk to the land agent is deputy forest commissioner. The salary of the land agent and forest commissioner combined is $2,500 annually and the salary of the chief clerk and deputy forest commissioner is $1,500 annually. The appropriation in 1912 for forest fire protection was $67,922.47. This sum was arrived at by a tax of a mill and one-half basis upon the valuation of the wild lands for taxation purposes. There is also an appropriation of $2,500 for public instruction in forestry, which is used to maintain a chair of forestry at the University of Maine. The Maine legislature meets biennially on the odd years, but separate appropriations are made to cover the two years. The chief forest firewardens and the deputy forest firewardens are appointed in the various forestry districts by the Forest Commissioner. The chief forest firewardens receive as compensation $3.00 for each day of actual service, with an allowance for expenses of travel and subsistance not to exceed $2.00 daily for such period. The deputy forest firewardens receive $2.00 and subsistence for each day of actual service.

Maryland.

The Maryland State board of Forestry is composed of seven men, of whom the Governor is president. The State Forester is the only statutory appointee of the board, at a salary of $2,000 per annum. All expenses of the board and the salaries of clerks and field assistants come out of the general appropriation. The legislature convenes biennially on the even years, but the appropriation is annual. The last legislature made an annual appropriation of $10,000 for the support of the work of the board, and $6,000 for publishing county maps, and also an appropriation of $50,000 for the purchase of forest reserve lands. The forest wardens are commissioned by the Governor and are not authorized to incur any expense until after a fire has been reported to them.

Massachusetts.

The State Forester is appointed by the Governor and council, and he, in turn, appoints his assistants. The legislature meets annually and the appropriations are made annually. The salaries are not designated by law. The Governor and council establish the State Forester's salary, which is $5,000. The salaries of the other officials are regulated by the State Forester subject to the approval of the Governor and council. The appropriations are as follows: $20,000 for general forestry; $10,000 for forest fire work; $10,000 for reforestation; $5,000 for reimbursement to towns for forest fire equipment. Besides this, there is an appropriation of $250,000 for the gypsy and brown-tail moth work, which is in charge of the State Forester. The firewardens are paid out of the appropriation for forest fire work.

Michigan.

The legislature convenes biennially, but the appropriation is annual. The salary of the State Forester is $1,600 per year. The appropriation is apportioned by the Public Domain Commission, to cover salaries and expenses of officials, expenses of members of the Commission and expenditures incurred in the management of the State Forests. The secretary of the Public Domain Commission, who is also Commissioner of Immigration, receives a salary of $2,500 per year. The other members of the Commission are reimbursed for expenses only.

Minnesota.

The State Forester is selected by the State Forestry Board, which, in turn, is selected by various boards, such as the State Forestry Association; the Agricultural Society; the Regents of the University, etc. The members of the board serve without pay. The only statutory position is that of the secretary of the State Forestry Board, at $1,800 a year. The salary of the State Forester is fixed by the board at a sum not to exceed $4,000 a year. The State Forester selects all the other officers of the service, including his assistant, who receives $2,000 a year. The rangers receive from $1,080 to $1,260 a year and their expenses; the patrolmen, $70 a month and pay their own expenses. The legislature convenes in the odd years and appropriations are made biennially, which amount to $100,000. Seventy-five thousand dollars ($75,000) of this fund is for the regular work of the service; $6,000 for the support of the State reserves, and $20,000 for the encouragement of tree planting on the prairie portions of the State.

Montana.

The Montana Board of Forestry is composed of the Registrar of State Lands, the State Land Agent, and the State Forester. No appropriations are made for forestry purposes, and the expenditures are made through the State Board of Land Commissioners. The State Forester is appointed by the Governor for a term of four years at a salary of $2,500 per annum and expenses when engaged in outside work. The Assistant State Forester is appointed by the State Board of Land Commissioners for such time as is necessary. He draws pay only when actually engaged in the performance of such work and his pay cannot exceed $150 per month. The firewardens are voluntary.

New York.

The Conservation Commission is divided into three offices: Water Supply, Fish and Game, and Lands and Forests. It is composed of three commissioners at $10,000 a year, and three deputy commissioners at $3,500. The division of lands and Forests has at its head a Superintendent of State Forests at $3,200; an assistant at $2,000; a chief surveyor at $2,500; five foresters at from $1,000 to $1,800; four locomotive inspectors at $1,200; a pathologist at $1,500, and over a hundred fire patrolmen at from $60 to $75 per month, about 30 of whom are employed the year around, and the rest about six months. There is also an auditor of fire accounts at $1,800; a special agent at $1,800 and five superintendents of fire at $1,200 per annum.

The appropriations are made annually as follows: $75,000 reappropriated and $25,000 newly appropriated for the acquirement of land in the State reserves; $25,000 for the enforcement of the conservation laws; $5,000 for the protection of the State's title to lands, by surveys, etc.; $50,000 for fire protection; $25,000 for general expenses of the Lands and Forest Department. Aside from the above, the salary list of those below State Foresters (patrolmen, stenographers, etc.) amounts to $27,000. All the offices of the Lands and Forest Department, except those of patrolmen and superintendent of fires, are under civil service. All the offices of the general commission, except those of stenographers are appointee.

North Carolina.

The forestry work is considered as a part of the work of the North Carolina Geological and Economic Survey. The total annual appropriation for this department is $15,000 and of this amount, about $3,000 is devoted to forestry work. The salary of the State Forester is $1,800 per annum. This is determined by the State Geological Board, which is appointed by the Governor.

Ohio.

The department of forestry in Ohio is at the State Agricultural Experiment Station and is under the supervision and management of the Board of Control, which is virtually a Forestry Commission. The members of the board receive no compensation. The appropriations, which are biennial, amounted to $19,500 in 1911. The organization of the department consists of the chief, paying $2,000; that of first assistant, paying $1,200. These offices are appointed by the Board of Control of the station. The expenses of the Board of Control are provided for out of the general fund of the station.

Oregon.

The State Board of Forestry consists of the Governor, the acting head of the Forest School of the Oregon Agricultural College, and five electors of the State appointed by the Governor upon the recommendation of five associations in the State. The members of the board receive no compensation for their services, but are entitled to actual expenses incurred in attending board meetings. The legislature meets in the odd years and an appropriation of $60,000 is made for the biennial period. The State Forester is appointed by the State Board, to hold office during the pleasure of the State Board, which also fixes his salary at $3,000 per year. He is authorized to appoint a deputy, whose salary is fixed by the board at $1,800 per year. These salaries are the maximum under the law. In 1911, 23 supervising firewardens were employed from June 1st to October 1st, at a salary of $100 per month and expenses. Voluntary firewardens are also appointed throughout the State by the State Forester.

Pennsylvania.

The legislature convenes in the odd numbered years and the appropriations are biennial. The statutory appointments are as follows:

Commissioner of Forestry	$3,000 00
Deputy Commissioner	2,500 00
Two Clerks, each	1,500 00

The appropriations made in 1911 for use for two years were:

Foresters	$110,000 00
Rangers	125,000 00
Labor	100,000 00
Surveys	10,000 00
Draughtsmen and Supplies	12,000 00
Examination of Titles	5,000 00
Expenses members of commission	3,500 00
Incidentals	55,000 00
Contingent	6,000 00
Academy	20,000 00
Purchase of lands	50,000 00
Forest fires	50,000 00
Tax on lands of schools and roads	80,000 00
Total	$546,500 00

This appropriation for foresters is to pay the salaries and expenses of the foresters who are in the employ of the State and in charge of the Forest Reserves and other forestry work. Their salaries range from $60 to $150 per month.

The appropriation for rangers covers the salaries of those men who are entirely on the forest reserves, with salaries ranging from $25 to $60 per month. The foresters and rangers are appointed by the reservation and forty-one of the foresters are graduates from their Forest Academy.

The labor appropriation is to cover expenses of all kinds for labor connected with the reserves by individuals other than foresters and rangers.

Surveys, draughtsmen and supplies covers the expenses for surveying the exterior borders of the State forestry land, making the necessary maps, etc.

The incidental appropriation covers any work of the department not otherwise provided for in the specific appropriations, such as dissemination of information to the public, pamphlets, bulletins, etc.

Contingent expenses cover the expenses of the office. The forest fire appropriation is for the extinguishing of forest fires anywhere in the State.

The taxation on lands covers the payment by the department of two cents per acre for roads and two cents per acre for schools, on each acre owned by the State in the various townships.

In addition to the Commissioner of Forestry, there are four members of the State Forestry Reservation Commisison who are appointed by the Governor. These individuals receive no salary, simply being paid their expenses in connection with the work of the Commission. There is also a chief surveyor at a salary of $1,800 per year, and a forest inspector at a salary of $2,100. There is also one stenographer in the department receiving $720; one bookkeeper at $900 and one at $1,200. These are all appointed by the department, and not by legislative enactment.

Rhode Island.

The Legislature convenes annually and the appropriations are annual. There is a Commissioner of Forestry at a salary of $1,000 per annum. Five hundred dollars per annum is appropriated for the expenses of the office and $1,500 per annum is appropriated for fighting forest fires.

Vermont.

The appropriation for forestry purposes is part of a blanket appropriation for agriculture and forestry, $20,000 a year being apportioned for the two lines of work. This money is divided by the State Board of Agriculture and Forestry between the two departments according to their needs; this year forestry received $11,000 of this amount. The expenditure in connection with the prevention of fires does not come out of this appropriation. Those expenses are paid by the towns and the towns are reimbursed by the State for any sums paid out over 5 per cent of their grand list. This reimbursement comes out of the general treasury of the State.

The legislature convenes in the even years. The only statutory appointment is that of State Forester, whose salary is fixed by statute at not to exceed $2,500. The exact amount is decided by the State Board of Agriculture and Forestry.

Washington.

The State Board of Forest Commissioners consists of the State Land Commissioner and four electors of the State, appointed by the Governor. They receive no compensation for their service, but are allowed necessary expenses incurred in the performance of their duties. The legislature convenes on odd years and the appropriations are biennial. The appropriations for the years 1911-12 were as follows:

State Forester and firewarden	$ 4,000.00
State firewarden and forest fire service	71,000.00
Firewarden—printing fund	1,000.00
Total	$76,000.00

The State Forester is appointed by the Board of Commissioners. He is also state firewarden. The assitsant state firewarden receives a salary of $1,200 a year. A forest fire service is maintained during four months of the year—June, July, August and September—in twenty-three of the timbered counties of the State. At the beginning of the fire season, a firewarden is appointed in each county and later in the season, when conditions demand greater supervision, others are appointed. The appropriation under state firewarden and forest fire service covers clerk hire, office and miscellaneous expenses. The largest part of this is expended in paying and rimbursing firewardens and men employed in fighting forest fires.

Each warden receives compensation not to exceed $4.00 per day, and also necessary and proper expenses for the time actually employed. The salaries and necessary expenses of all wardens, together with all expenses incurred in forest fire protection, are borne in the proportion of two thirds by the State and one third by the county in which the service was given and the expense incurred for forest fire protection.

West Virginia.

There is no direct appropriation for forestry in this State. The work is included under the department of forest, game and fish, and the forest, game and fish warden has charge of the work. The only effort being made is in the control of forest fires. All deputy wardens are also ex officio fire wardens and receive two dollars a day for all time actually employed in putting out fires. All expenses incurred in extinguishing fires are required to be paid by the county in which the fire is located. The forest, game and fish warden receives a salary of $1,800 per annum. He has two chief deputies who each receive a salary of $900 per annum and their traveling expenses.

Wisconsin.

The members of the State Board of Forestry receive no compensation. They are allowed their expenses incurred in the performance of their duties. The legislature convenes biennially on the odd years, but most of the appropriations are annual. The appropriations are as follows: Administrative, $35,000 a year; for purchase of forest reserve lands, $10,000 a year; for purchase of forest reserve lands, $50,000 for five years; forest reserve fund, about $75,000 a year.

This forest reserve fund consists of the proceeds of all sales of scattering and agricultural lands, timber, etc. This fund varies, but the income has been averaging about $75,000 per anum.

Three salaries are fixed by statute provision, namely: State Forester, $3,600 per annum; assistant state forester, $2,000 per annum; chief clerk, $1,500 per annum. All other salaries of cruisers, rangers, forest assistants, etc., are paid out of the general fund, the salaries being fixed either by the State Board of Forestry or the State Forester.

The following comparative table gives a summary of the appropriations of the various states in which forestry work is being conducted. Special attention is called to the acreage of timbered land and their corresponding appropriations:

COMPARATIVE TABLE OF APPROPRIATIONS FOR FORESTRY WORK.

State.	ANNUAL FOREST APPROPRIATION.					Total area, acres.*	FOREST AREA.	
	Salary.	Maintenance and general.	Protection.	Purchase of State forests.	Total.		Acres.	Per cent of land area.
Alabama		$500			$500	32,818,560	20,000,000	61
California	$6,400	8,750			15,150	99,898,880	24,000,000	24
Connecticut		8,500	$1,500	$2,500	12,500	3,084,800	1,600,000	52
Hawaii		14,000			14,000			
Indiana	2,800	4,058			6,858	22,966,400	4,000,000	17
Kentucky		15,000			15,000	27,715,840	10,000,000	39
Louisiana	2,300	900	62,500		65,700	29,061,760	16,500,000	57
Maine	4,000	2,500	67,922		74,422	19,132,800	14,900,000	78
Maryland	2,000	16,000		50,000	68,000	6,362,240	2,200,000	35
Massachusetts		280,000	15,000		295,000	5,144,960	2,000,000	39
Michigan		15,000			15,000	36,787,200	15,500,000	42
Minnesota	1,800	50,500			52,300	51,749,120	15,500,000	30
Montana	2,500				2,500	93,296,640	18,000,000	19
New York	61,800	55,000	50,000	100,000	266,800	30,498,560	12,000,000	39
North Carolina		3,000			3,000	31,193,600	19,600,000	63
Ohio		9,750			9,750	26,073,600	4,800,000	18
Oregon		30,000			30,000	61,188,480	27,000,000	44
Pennsylvania	7,000	223,250	25,000	25,000	280,250	28,692,480	9,200,000	32
Rhode Island	1,000	500	1,500		3,000	682,880	250,000	37
Vermont	2,500	11,000			13,500	5,839,360	2,500,000	43
Washington	2,000	500	35,500		38,000	42,775,040	25,000,000	58
Wisconsin	7,100	110,000		20,000	137,100	35,363,840	16,000,000	45

*Area, and Forest Area: "Report of the National Conservation Commission," Vol. 2, page 346.

State Forest Reserves.

It is probable that much of the logged-off land will not be reforested unless the work is undertaken by the State. Some States have already adopted the policy of acquiring such land for State forest reserves. In some instances large appropriations have been made for this purpose. In our own State a start could be made, without cost, by retaining delinquent tax land at the expiration of the redemption period. Such areas, which are proved upon examination to be of value for forest purposes, should be permanently withdrawn from sale, and the remainder released. This question has not yet been given much attention. It deserves consideration, however.

The following table shows the progress made by other States in establishing State forest reserves:

State.	Area in acres.
Indiana	2,000
New York	1,641,523
Pennsylvania	920,763
Michigan	231,349.58
Massachusetts	2,000
Connecticut	1,509
Maryland	1,960
New Jersey	18,720
Wisconsin	385,000
Vermont	1,760
Minnesota	51,000
Kansas	600
Total	3,253,184.58

CHAPTER VI.

FORESTRY.

MANAGEMENT, PROTECTION AND WOOD PRESERVATION.

Because of numerous inquiries received and the popular interest displayed of late by teachers and others desiring a brief and concise discussion of forestry, this chapter is written. Forest literature is most incomplete; is scattered in various Government and State publications, and is often not available. The following topics are chosen because they are the ones in which there seems to be the most interest.

Definition of Forestry.

By forestry is meant the management and culture of a forest in such a way as to yield repeated or future crops of timber. Lumbering operations have been paying little or no attention to a future crop and have devastated the forests to such an extent that natural reproduction is not always possible. When a forest is cut, the forester aims to replace it by a new growth, protect the seedlings and young trees, which by the old lumbering methods were oftentimes destroyed, and so obtain from the forest, the highest possible yield, profitably as well as conservatively.

A forester, then, must have a thorough knowledge of the life and characteristics of trees, must know the art of forest reproduction and be familiar with and experienced in modern logging, to carry out forest policies in a practical manner.

The Importance of Forests.

The importance of forests lies chiefly in the numerous uses to which they are put. As a whole, they are of importance in providing shelter and food for certain of our domestic animals, protecting agricultural land in their vicinity, harboring game, preventing erosion in one locality and fixing drifting sand in another, in beautifying the landscape in general, and furnishing healthy employment to many.

Influence of the Forest on Climate and Soil.

The beneficial effects of forests on the land in their vicinity was formerly, and to some extent still is, somewhat exaggerated, or at least sought for in the wrong direction. To the forest was attributed the capability of altering the temperature, regulating precipitation, and controlling the humidity of the atmosphere. In fact, the impression conveyed by these statements was, that whatever imperfection the climate of the district possessed might be remedied by the establishment of forests. However, the forest is not without its favorable effects by any means. Apart from the fact that they add organic matter to the soil, forests have a beneficial action in

(1) Preventing direct sunlight from reaching the soil,
(2) Breaking the force of the wind,
(3) Reducing the force of heavy rains, and
(4) Binding soils apt to be carried away by flooding and drifting.

In hilly country the prevention of erosion is, without doubt, of great importance. The water from heavy rains, checked in its descent by meeting first with the foliage of the trees, is better retained in forest soil than on bare land. Under a close cover of trees there collects a humus soil formed from the decay of fallen leaves. Through this soil-covering the rain slowly filters, and its passage is further retarded by the stems and roots of the trees. In this way the erosive effects of heavy rains on bare hillsides are interrupted.

In the case of shifting sands, the roots of trees, shrubs, and wild plants, and the covering of humus formed from dead leaves, serve to bind the soil. Forest growth is essential in such cases, for, when level tracts of loose soil, without forest or other cover, are exposed to the wind, sand dunes are apt to be formed. These advance in the direction of the prevailing wind, oftentimes destroying valuable agricultural lands.

Sylviculture.

The reproducing of the forest, known technically as sylviculture, is next of importance in our discussion.

The aim in establishing a forest, is to constantly produce under given conditions, the most valuable timber crop with the least expenditure of time and money consistent with good results. In other words, sylviculture involves the art of establishing, developing and maintaining a forest.

1. *Establishing forests*—The seed stage of plant or tree life. This may be carried on by

a. Natural reproduction; or

b. Artificial reproduction which denotes seeding or planting.

2. *Developing forests*—Involves the care, culture and protection of these seed or plant areas in such a manner as to secure a good crop with the largest possible returns in the shortest period of time. The objects, therefore, of sylviculture may be

(1) To secure quick reproduction after the timber has been removed.

(2) To produce species which will give best returns. That is, produce valuable marketable species.

(3) To manage the area so as to produce a full crop of good quality and form.

(4) To obtain an annual yield and to accomplish all this on a practical rather than a theoretical basis.

(1) *Quick Reproduction.* This, in many cases, is hard to obtain because of the abuse to which forests have been subjected. Especially is this true where clear cuttings have been made, thus making the area easily susceptible to fire and entirely killing whatever natural reproduction may be present. Take, for example, the formerly timbered areas of Michigan and Pennsylvania. Their forests were cleared by lumbering and fires. This, in many cases, is true even in California and in many cases these cleared tracts are covered entirely with chaparral and worthless brush. The areas are as capable as formerly to produce good timber, but the seed trees necessary for reproduction have been destroyed, and consequently many years will be required for natural reproduction to take place. Even where fire has not played so important a part, but where the usual lumbering methods have been carried on, reproduction is none too fast. Loss of growth is the result, the soil lies idle and the time existing between cutting the timber to the maturity of a new crop is much longer than necessary.

(2) *Species.* A term much used in technical forestry is "locality." It comprehends both soil and climate—the latter being influenced by situation, as they effect tree growth. The locality largely determines the species to grow and the sylvicultural treatment to adopt for a given area.

Here is where the managerial ability of the forester comes in. Apart from the general management of the forest, the prosperity of the trees depends upon the physical and chemical composition of the soil, the geographical position, the altitude, slope and aspect of the ground. In selecting trees or determining a species to be grown, general conditions that are found to prevail must be considered.

Market, undoubtedly, in many cases determines the species to be grown, providing of course that the soil is capable of producing market-demanding species.

The quantity of moisture in the soil has a very great influence in determining the species which will grow, for on dry soils occurs one type of tree, and on wet soils, another.

The purpose of sylviculture is to improve the composition of the forest, so that a given area will be occupied by the species best adapted to the existing conditions.

(3) *Full crop of good quality and form.* Sylviculture not only aims to reproduce forests but to produce as many trees and of as good quality per acre as is possible. Under good methods of forestry our American forests should produce more timber. At present they are not doing this, the reason being that the stands are very irregular. Many trees are crowded, or growing in the open, the latter with their wide-spreading branches occupying a great deal of space to the exclusion of other trees. Then again, there are many open spaces occupied by brush, shrubs, or are entirely bare, that might be growing trees.

Forests usually contain large numbers of trees that are crooked or forked, or have low branches which hinder their otherwise high commercial value. Usually, such trees are good only for firewood though they are large enough and of the right species to furnish good timber. Thus, frequently, one sees a stand, one hundred years old, with trees of such poor form that the timber is worth only a small percentage of what it would have been had it been managed properly.

(4) *Annual Yield.* In the establishment of forests the aim must always be to constantly produce for the given conditions, the most valuable timber crop with the least expenditure of time and money consistent with good results.

To perpetuate such an aim, a forest must yield annually, or over some other convenient period, certain amounts of timber. Thus defined, the sustained or annual yield of the forest is that number of cubic feet which a forest produces annually; the annual removal of this amount of timber then, will not decrease the original amount of stumpage.

An annual yield offers to the lumberjack steady employment in one and the same forest or sawmill, while to the owner, an annual yield offers approximately equal annual dividends.

Where no yield is possible for a series of years, the outlay of taxes, protection and administration usually prohibits the owner from attempting conservation.

The Tending of Woods.

In the management of growing woods, attention must be given, not only to the immediate wants of a crop, but also to the preservation of the fertility of the soil.

An intimate relationship exists between the forest and the forest soil. Leaves, needles and dead twigs, cast down by the trees, form a mulch of decomposed and decomposing organic matter. This mulch or humus is very valuable to the forester as it supplies plant food to the tree; it retains moisture in the soil and absorbs it from a damp atmosphere; it lessens or breaks up a stiff soil and makes an overloose soil compact. The preservation of this valuable product ought to be the constant care of the forester. Its presence, as mentioned above, makes a poor soil rich; without it, even the good soil deteriorates.

Weeding or Preliminary Thinning.

This operation takes place after a young crop has been commenced, from seeding or planting. In other words, the term "weeding" implies the act of removing early material not intended to take part in the development of the wood. This condition is usually brought about by keeping the young plants close together and limiting the light to the upper portion of the crowns. In places where the young trees are apt to suffer badly from bending or crushing by snow, it has been found best to merely take the tops from undesirable members rather than to at once cut them away entirely.

"Weedings" should be begun early, be carefully carried out, and confined to the clearing away of individuals that threaten to injure the welfare of the young wood.

Thinnings.

Late "weeding" and early "thinning" are similar in that they consist in the removal of wide-spreading, misshapen, and other objectionable trees. As crowding begins to have its effect, the dead and dying trees increase in number, and the young wood should be relieved of these. The first thinning usually takes place from the fifteenth to thirtieth years. Nothing but the cost of operation need deter the forester from making a thinning at any time, no matter how early.

The object of thinning from a sylvicultural standpoint, may be defined as the production of straight healthy stems of proportionate diameters but free from side branches. Through the maintenance of a very close crop in the early periods of growth, the later thinnings may be devoted more and more to the development of the better trees. This consists in the removal of trees that have recently passed into a sickly, dying and dead condition.

There is a struggle for existence in woods of proper density which continues through the life of the wood. This struggle is chiefly among the crowns, which compete with each other for space and light. This competition is due to there being more trees upon the area than can possibly grow and live. As the light is to be had from above only, all the trees press upward in long, straight growths. The shade of the crowns has, further, the effect of making clean stems by ridding the trees of their side branches.

Because of these influences imposed by density, certain cuttings and thinnings become essential; the frequency of thinnings is determined by the energy of growth in the woods' development. In young woods the interval is generally about five or six years, and in older woods, ten to fifteen years.

Crown development, therefore, is the guide for carrying out thinnings. Three general sections may be considered, the Dominant, Co-dominant or secondary, and dead trees.

1. Dominant trees are those which possess well-formed crowns and occupying the upper position in the crop.

2. Co-dominant trees comprise the lagging, overtopped, and dying stems.

Trees are constantly being crowded out of the principal into the inferior classes. Occasionally, however, a portion of the crop raises itself from the latter to the former class.

Attention to soil and wood crop and the increase of the total production of good and useful timber are the objects aimed at in the modern system of thinning. The yield which the cuttings give is of minor importance.

Uses of Thinnings.

The practical results derived from thinnings are as follows:

1. Improved quality of product. The forester can develop timber of high quality, produce good merchantable lengths and obtain even the straight-grained lumber. He also reduces the percentage of crooked and forked trees.
2. Rapid growth of trees. A crop can be in a mature state several years earlier than without thinning.
3. Total yield is increased.
4. Better and more cordwood.
5. Less danger from fire, as the dêbris, slash, etc., is removed.

Sylviculture covers a large field and involves several other subjects not mentioned in this discussion. The formation of woods by seeding and planting could be handled more in detail, as well as describing nurseries, testing seeds, collecting and storing seeds, methods of sowing, soil cultivation, planting, transplanting, etc., but that would be going into a detailed discussion and this chapter was intended merely as a general one.

Pruning.

Natural pruning is the rule in sylviculture. The crowns in a close wood monopolize the light and compel the lower branches to die through overshading. But, there are cases when artificial pruning is required, to prevent young plants being harmed by the branches of larger trees suppressing them. Pruning carried out to increase the commercial value of the timber should be restricted to the removal of dead and the lower of the weak green branches. Trees with strong lower branches left as shelter or for seed when regenerating forest ground, are often pruned to relieve the young crop at a time when their complete removal would be dangerous.

The season for pruning is usually from October to February or the early part of the winter.

Forest Protection.

By forest protection is meant the preservation of forests against damage by man and that brought about by natural influences, such as animals, noxious plants and atmospheric influences.

1. Forest protection against damage caused by man. In safeguarding the forest against the advances and trespass of man, it is of vital importance that all boundaries of the forest be defined by means of landmarks. Artificial landmarks, such as fences, ditches, stones and stakes, are the usual form used in marking boundaries.

2. Protection against fire. In virgin forests, fires originate in clearing land for farming, lumbering, in extending pasturage, in failing to extinguish camp fires, etc. They are generally the result of carelessness or recklessness, the throwing away of lighted matches, cigar and cigarette butts, lack of proper attention to fires lighted for the disposal of slash, lightning, and various other causes. Occasionally, they can be traced to incendiarism, and sparks from railway engines are also very dangerous. For these reasons, the United States seems to be subject to large forest fires annually.

Forest fires are most common during the summer months, especially after a long period of drought. Young coniferous woods are those most liable to fire because the soil covering of needles and twigs is very inflammable, and, when lighted leads not only to its own destruction, but generally to that of the trees as well.

Forest fires may be divided into the following three classes:

1. Surface fires: The commonest form, a burning of the litter or soil covering of leaves, twigs, grass, etc.
2. Crown fires so frequent and disastrous in the United States. These burn the crowns (foliage and branches), and usually originate from surface fires.
3. Ground or deep soil fires which on account of the peaty nature of the soil burn slowly but persistently. Practically the only way to extinguish a fire of this nature is to cut trenches down to the mineral soil, when the peat is not too deep, and run water along the trenches or flood the area.

The character of a fire is greatly influenced by the condition of the atmosphere. The greater the velocity of the wind the more rapid the progress of the fire. A fire burns more severely when the wind is constant than when it is gusty, and burns more fiercely when the atmosphere is dry. Fires therefore, are more severe during the hot part of the day and are retarded at night when the atmosphere is moist. The assertion often made that night is the best time to fight fire is thus explained. At night the air is usually damp and heavy, accompanied by little or no wind.

Preventing Fires.

Preventive measures should aim at lessening the risk and limiting the extent of forest fires as much as possible.

A system of fire lines, that is, intersecting or joining trails should be arranged through the forest, a patrol system, telephone system, and lookout stations manned by responsible men should also be installed. Above all, have an efficient fire-preventing and fire-fighting organization. The fire lines would prove valuable, both as a means of transportation, as well as a means to back fire from, and the other systems, mentioned above, would afford a means of quickly detecting and locating fires, as well as notifying the proper authorities when in need of assistance.

Restrictions as to lighting fires within the forest and the smoking of tobacco should be made, coming into effect during the dangerous season of the year at least. Locomotives passing through forest areas should be equipped with spark arresters to prevent the throwing of live cinders and sparks.

Nearly all forest fires start as surface fires, but once under way, can easily enough develop into crown fires. At first the front of a surface fire is narrow, but gradually, with its increase in velocity, due to the draught, widens and takes the form of a broad irregular line. This front may develop in proportions from a few feet to a number of miles in width. Of course, the intensity of a surface fire will depend greatly upon the inflammable material, topography, character of soil and the atmospheric condition. Forest fires are usually fought by means of trails, constructed around a fire. These trails are patroled until the fire is out to prevent its crossing and spreading. Since fire runs up hill with a greater rapidity than down, trails should be constructed along the tops and bottoms of ridges, so far as conditions will permit. Such fires do less damage, they burning with greater velocity than those located on level ground where fires burn steadily, gathering greater volume and extending over vast areas.

In fighting fires in California, it is usually necessary to back fire. Back firing consists in burning along the fire lines toward the burning area. It proceeds slowly against the wind and prevents the main fire from "jumping" the "line." In this way the force of the fire is broken. A careful watch must be kept until the danger of a new outbreak has passed. Any practical plan of fire protection must be reinforced by State fire laws, and a competent organization to enforce them.

Damage by Fire.

The more important damages caused by fire are:

1. Injury to the soil and ground cover.
2. Injury or death to standing timber.
3. Killing reproduction.
4. Destruction of game and its food supply.
5. Financial loss.

1. Injury to the soil and ground cover. In every forest a certain amount of humus is mixed with the mineral soil and is very essential to good ground cover. If a forest is burned, the humus in mixture with the mineral soil, gradually disappears, and since the leaves which fall are destroyed and no new humus is formed, the soil is injured. Fires, by destroying the humus, make the soil susceptible to erosion, thus taking away the moisture-holding ability of the ground cover.

2. Injury or death to standing timber. Many trees, and especially young trees, are entirely consumed by fire. If they are not burned outright, they usually are so badly scorched that the buds, foliage and living tissues are killed. Surface and ground fires both are very dangerous in this respect, the latter burning slower but nevertheless generating enough heat to kill the living tissues of the roots. Many fires do not kill a tree outright, but merely kill a portion of the roots or trunks. A tree being burned on one side, which is usually the case, may live for a long period and if the wound is not large it may heal. Commonly, when one side of a tree is killed, fungus diseases attack it, and trees partially injured and weakened by fire are subject to the attack of insects.

3. Killing reproduction. The greatest damage done by fire is that of destroying the young growth. They burn easily, especially the conifers which usually are totally destroyed. Light fires which often run over the ground and which are often thought of no consequence, destroy the seeds in the surface soil and the young tree seedlings, besides injuring the forest floor. This state of affairs will not warrant the reproduction of a forest.

4. Destruction of game. When the forest is burned, our valuable game goes to other regions. They are either killed outright or must seek shelter and feeding grounds elsewhere. This is of vital importance to the sportsman if he will have

game to hunt in the future and he should assist in every manner possible to protect our forests against fire. Game must have feeding grounds and forest fires make this impossible.

5. Financial loss. Valuable timber holdings and oftentimes homes, are totally destroyed by forest fires, thus rendering many penniless and homeless. Again, as in the case of the big fires of 1910 in Idaho and Montana, many lives were lost. Is not fire protection worthy of our attention?

Protection against Mammals and Birds.

The animals, harmful to woods, may be considered in the following order:

1. Domestic grazing animals.
2. Game and rodents.

1. Domestic grazing animals destroy the forest by nibbling buds, shoots, and leaves, trampling upon seedlings and young growth and in various other ways. Goats and sheep are the most harmful, they killing the young growth. Cattle in a forest do not damage trees to a very great extent, preferring grass if it be present; still, both they and horses bite and tear plants, as well as injuring surface roots by treading. These animals therefore should be allowed entrance only when they can do the minimum of damage.

2. Game and rodents. A great number of the woods in the country have been regarded as harbors for game. This is true and game will always, if protected properly, live in the forest; it is their home.. Nevertheless, in many cases, game is damaging our forests.

The most harmful of the animals considered as game, is the rabbit. It bites and gnaws the bark of woody plants, and nibbles the young shoots of practically all species of forest trees. Rabbits multiply very rapidly, and, because of their great numbers, do considerable damage. Deer also injure young trees very seriously by browsing on the twigs and by rubbing off the velvet from their horns. In doing the latter, the buck usually selects young and slender trees.

Rodents: Of the small rodents, squirrels and mice inflict the most damage. The squirrel is well known to eat and stow away seeds and to bite off twigs for the sake of the buds on which he feeds. It also has a habit of stripping the bark from young trees.

Mice do serious damage by gnawing the bark of young trees, eating acorns and beech nuts and wasting seed beds in nurseries. The wood or field mouse kills plants by severing the roots just below the surface of the ground and by gnawing the stems. When planting in a nursery therefore the seeds should first be coated with red lead.

Birds are troublesome, chiefly in the forest nursery, where they scratch up the seeds, or first leaves. However, most birds, by destroying insects, are much more useful than injurious.

Protection against Insects.

Now we are all familiar with animals and rodents, but did you ever sit down on an old log and notice the myriads of ants, beetles, butterflies and other members of the insect army? They are numerous to be sure and to every animal, there are many insects in a forest. In this vast army of insects the forest has many enemies, some of which do a great deal of harm. In fact, next to fire the greatest damage to forests is done by insects. Sometimes, because of their great numbers vast areas of forests are attacked and rendered worthless. Their damage is generally most severe after forests have been burned. Perhaps the most extensive damage is that done by bark beetles, which burrow in the inner bark of the trunk and girdle the trees.

Damage due to Natural Influences.

The forest is exposed to many dangers difficult to fight, but it is practically defenseless against such elements as storm, snow, frost and drought. Yet, even in resistance to these, man has devised certain measures, which, while they are not able at all times to prevent damage, can frequently retard to a certain extent.

Storm.

Wind storms may affect quite an area, cutting out strips or belts of trees and leaving the rest of the forest untouched: or they may be more scattered. It is when gales follow immediately upon heavy rains that have saturated the soil with water, that they prove most destructive, for the soft ground is then least able to support the roots. The direct damage caused by wind is that of throwing or uprooting the trees, or of breaking the trunk above the surface of the ground. The latter causes the greatest loss.

Of course there is no way of protecting forests against tornadoes, but for ordinary winds and gales, some steps may be adopted. A forest can be made more wind firm by mixing shallow-rooted with deep-rooted species. Windbreaks may be built along exposed borders of woods and a forest may be thinned from youth onward so that stout, thick branched, storm-resistant trees result.

Snow.

Damp snow falling in large flakes clings to trees, and in case of the pine or spruce it is apt to form a continuous cover upon the crowns of a close forest. This, owing to its great weight, bends and breaks the trees, the danger being increased if frost follows the snowstorm and prolongs the time which the trees must support the burden.

Broad-leaved trees are able to resist damage from snow much more readily than conifers, in that they are without foliage in winter. With them, injury is possible only when snowfall takes place unusually early or late.

Very little can be done in defending woods against snow; but careful planting, together with early and frequent thinning, help materially in saving the trees.

Danger from frost and drought is to be feared chiefly during the plants' early youth. Natural regeneration may here be necessary, as the old growth will protect the young. For work in the forest nursery, artificial shading and covering weak species with branches and leaves should be made.

Injuries which may result from frost and the sun are:

1. Frost cracks.
2. Frost lifting.
3. Bark scorching.

1. Frost cracks are longitudinal fissures in the stem caused by intense cold in winter; starting at the bark, they reach more or less deeply into the wood, and may even penetrate to the center of the trees. In some cases these cracks are healed over, but usually are reopened, making the crack larger each season. Oak and elm are frequently subjected to frost cracks.

2. Frost-lifting affects small plants on loose soil. Owing to the freezing of the water present, the soil is heaved up and seedlings with shallow roots are raised with it; the soil regains its former position when warm weather sets in, but the small plants which have been torn away fall over on the surface of the soil and die.

To prevent frost-lifting, avoid stirring the surface soil of nurseries in late summer or autumn and provide a covering of leaves, needles and moss.

3. Bark-scorching occurs on all smooth bark trees; the bark becomes excessively heated by the sun—usually on the west side of the tree—dies, cracks and falls off. Underneath, the sunburned wood is then apt to be destroyed by rotting. Trees with low branches are seldom harmed.

USES OF FORESTRY.

Besides its value as a protective agent as discussed in "The Importance of Forests," forestry plays an important part in sheltering farm crops and orchards from strong winds and avoiding sand dunes and snowslides when in the form of wind-breaks. The Middle States have practiced wind-break culture for several years, but the enthusiasm is dying out, owing to the fact that the young farmers have never experienced the period of strong winds which prevailed in the early days, endangering their stock and making their homes almost uninhabitable. They are unable, therefore, to fully appreciate the importance of the wind-breaks built by their fathers.

Railroads are particularly interested in wind-breaks for snow protection, since even a light snow may cause serious damage to traffic. Consequently, to protect their tracks from snow, railroads have, in mountainous regions, constructed miles of snowsheds at considerable expense, and in open country have placed board fences to act as wind-breaks on the windward side of the track. In time, these will be replaced with forest growth, for undoubtedly railroad companies will save much money by so doing. However, a wider right of way will be necessary, and this seems to be the chief objection.

The value of wind-breaks to farmers and ranchers is well in mind, so we will not discuss it any more.

Another very important asset to the rancher is the farm wood lot. Wood lots, the purpose of which is to furnish a wood supply, when properly managed will not only supply the rancher with fuel, but will also provide a means of carrying on a profitable business.

The sugar bush or maple syrup and maple sugar industry is also a profitable proposition which ranchers can practice, because there is always a demand for sugar and syrup.

The growing of medicinal plants has proven profitable in several localities throughout the United States, and really this item should be considered seriously, for there is a perceptible shortage of wild growing native medicinal plants in this country. For this reason, medicinal plants would always find a ready market. For further reading matter on this subject, write to the State Forester for Bulletin No. 2, entitled "Pharmacal Plants and their Culture."

In addition to the projects already mentioned, the growing of Christmas trees has been very profitable in the Lake States. In one case a farmer made a profit of $2,000 from a ten acre tract of black spruce in the short period of seven years.

Forest nurseries all over the country are finding it profitable to grow young trees for forest planting purposes; one can readily see there the vast field for beneficial and profitable uses of forestry.

Mensuration.

By mensuration is meant the determination of the volumes of a forest crop—for instance, determining the volumes of trees, logs, and tracts of timber. This involves cruising, scaling, taking measurements and the making of yield and growth tables, for determining both present and possible future yields. A thorough knowledge of mensuration is essential to one buying or selling logs, determining the value of forests, and especially is it essential to the lumberman.

The unit of measure used in this country for buying and selling logs or tracts of timber is the board measure or board foot. When a man or company wishes to buy logs the question to be determined usually is, what does the tract run per acre, or how many thousand feet of logs have you got on your decks? A board foot is a board 1 by 12 by 12, that is, a board measuring one inch thick, twelve inches wide and twelve inches long. Hence, all measurements referring to the volumes of logs and timber are in board feet. Therefore, to determine the contents of any piece of lumber, multiply the product of the width and thickness in inches by the length in feet and divide by twelve. Thus:

A 3 by 6 board 12 feet long has $\frac{3 \text{ by } 6 \text{ by } 12}{12} = 18$ board feet.

The above formula is applicable to sawn lumber only when you have regular measurements. But, as can readily be seen, the board foot contained in a round log could not be determined in this way. In the United States logs are measured in board feet. For this purpose many different log rules or scales for different specie and locality have been constructed. A log rule or scale is supposed to show the amount of lumber which it is estimated can be sawn from a log of a certain diameter and length.

Several conditions must be considered in constructing log rules and for this reason, and because of variance in opinions concerning these conditions, log rules are very inconsistent.

The factors usually taken in consideration in constructing log rules are:

1. Allowance for slab, which is the first piece sawn from a log before actual lumber is obtained. This of course determines the width of the smallest board which may be used, and much waste can result. As an example, if a board eight inches in width is the narrowest that can be used, there will be considerably more waste in slabbing than if a four inch board could be sawn.

2. Kerf or thickness of the saw is important, in that a thick saw will waste more in sawdust than a thin one. In this respect the modern band saw with its kerf of ⅛ or 3-16 inch is less wasteful than the old-time circular saw, the latter wasting ¼ or 5-16 inches every time it goes through a board.

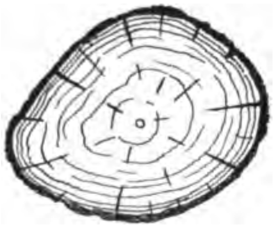
3. Thickness of boards. The fewer the cuts in a log the greater the scale. Thus a log sawed into three or two inch boards will scale more and be less wasteful than one cut into half inch or inch boards.

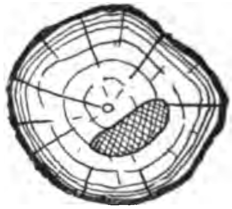
4. The sawyer's judgment is very essential, in that it is his duty and object to get as much lumber with the least waste in slabbing and kerf as possible. Of course he has his stock to fill, but at that he saves all that he can. It means money in the pocket to the millman, and for this reason it behooves him to get the best sawyer available. Other factors which must be considered in constructing log rules are, the defects in itmber, efficiency of mill machinery and the taper of trees.

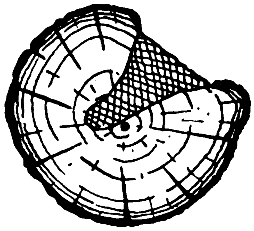
For the above reasons many log rules are in existence and it is hard to say which one is best, a different one being used in nearly every locality. However, the Scribner and Doyle rules are perhaps the best known. The Scribner is the oldest, while the Doyle is used throughout the country, generally speaking. The former is based on computations derived from diagrams drawn to show the number of inch boards that can be sawed from logs of different sizes after allowing for waste, and the Doyle rule is constructed from formula. Following is the formula: Subtract four inches from the diameter of a given log, which is the allowance made for slab; square one fourth of the remainder and multiply by the length of the log.

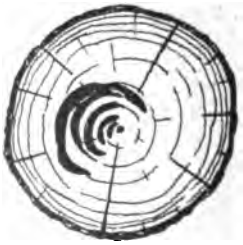
In practice, these figures are placed on a scale or log stick so that on one edge one may find the diameter and directly opposite on its face the contents of the log. Thus, when the "scaler," the title given to the man scaling, wishes to ascertain the contents of a log, the scale is placed on the small end and the diameter inside the bark is noted. The contents may be found directly above on the faced side of the rule. Each line of figures on a scale represents the board feet for one length of log, the length being noted on the left end of the scale. So, when looking for the contents, follow the line of figures representing the length of the log you are scaling. The scaler must be a man of wide experience. It may seem to be an easy operation and one necessitating no skill whatever, to a person unfamiliar with timber; and it would be if all the logs on a skidway were sound and straight. Such is not the case, however, for many logs are cracked, forked, lop-sided and rotten, making deductions necessary when scaling. For these reasons skill is required and oftentimes the scaler must decide whether or not to "cull" certain logs.

The following figures show some of the defects encountered by scalers when determining diameters. (Shaded portions denote defects of rot, wind shake, etc.)









Scaling Logs.

In the New England and Lake States, where logs are cut into short lengths and decked on skidways, a log scaling crew usually consists of two men, one man scaling and stamping while the other tallys or records. However, in many localities only one man is necessary. In measuring the diameters of logs they are rounded to whole inches. Thus, if a log is nearer nine than eight inches in diameter, the log is tallied nine inches. Many careful scalers, however, take the small figure, especially when buying logs for veneering purposes, where the rotary cut must be considered.

When logs are not round, the rule is placed at a point on the log where the diameter is about an average.

The records are commonly made on a blank book or wooden scale paddle in the woods, from which later, in camp, they may be transferred to the regular log tally sheets. In recording measurements the most simple and common way is to tally diameters and lengths, and afterward computing the volume, or, record at the skidway the board contents of each log when scaling.

When a log has been scaled it is usually marked in some way so as not to be scaled a second time. This is usually done with chalk. A log to be culled receives a special mark.

At this time or later the logs are stamped with the marking hammer which bears the proprietor's initial or particular trademark. The principles of scaling are practically the same in any region where short logs are cut. Logs loaded on cars in the woods are usually scaled after loading and on a "drive" logs are scaled before being "spilled" into the river.

Now that the unit of measure, the log rule and its application are in mind, let us turn our attention to the ascertaining of the volume of standing timber properly termed "cruising" or "estimating." Before taking up the various methods of timber cruising volume tables will be discussed. These are used by foresters in surveys.

Volume tables give the average contents of trees of different sizes and may be made for any unit, such as board measure, cubic, cord, etc. And, again, they may be constructed for different localities. The latter is the type used in the United States. They are based on measurements taken in some certain locality and therefore must be made for each new region, say for a township, or any fairly sized area of timber which is to be estimated. Volume tables for trees of different diameters are perhaps the most simple and are in common use in estimating the contents of standing timber. To obtain the total contents of trees of any given diameter, multiply the number of trees by the volume given in the table for that diameter. Thus, if the average volume of a tree 12 inches in diameter is 18 board feet, and you have 200 trees of this diameter, 18 by 200, or 3,600 board feet is the volume. Do this for each diameter to obtain the total volume of the stand.

Method of Constructing Volume Tables.

The tables are based on measurements and computations of large numbers of felled trees and are usually obtained during lumbering operations. A crew of two or three men follow the woodsmen and measure the trees as they are cut.

The measurements necessary in constructing volume tables are:

1. Diameter at breast high (4.5 feet from the ground).
2. Diameter at each cross section, inside and outside bark.
3. Length of each log.
4. Length of top above last log cut, and
5. Height of stump. The total of these lengths will then give total length of the tree.

About 500 trees at least should be measured where timber is uniform. This will give good results for careful cruising, but when only a rough cruise is desired, 100 trees will suffice. Measurements should be made of the average trees of each diameter throughout regardless of total height. In other words, each tree should be a representative of its class. If 100 trees are to be measured care should be taken that the diameters are well distributed.

With the above data, the volume of each tree can readily be computed. To obtain the volume of a log, multiply the average basal area by its length—that is, look up the table of basal areas corresponding to the end diameters of your log, and multiply the average by the length. To obtain the volume of the cone, or top of tree above the last log cut, multiply its basal area by one third the altitude or length. The total of these figures will denote the cubic contents of your tree.

Now that the volumes of all the trees have been calculated, arrange them by species in diameter groups or classes and take their average. This is best illustrated by the following sample table:

Specie, Sugar Pine—Volume table of different diameters.

Diameter, class breast high (inches).	Average diameter of trees measured breast high (inches).	Number of trees measured.	Average volume of trees measured (cubic feet).	Average results of column 4 evened off by curve (cubic feet).
6	6.15	6	4.8	4.6
8	8.25	20	7.6	7.2
10	10.00	15	11.8	11.4
12	12.20	14	17.0	17.8

For convenience, a curve is now constructed, and is obtained by plotting the figures computed in columns 4 and 2 on cross section paper, as ordinates and abscissæ, respectively. So, for the final results in column 5, the values are read direct from the curve.

The volume table just described is only one of the many types which may be constructed. They are made to suit the purpose for which they are to be used. Other types which may be constructed are: Tables for trees grouped by diameter and number of logs and for trees of different diameters and heights, etc.

"Cruising" or "Estimating."

Volume tables are of aid to the timber cruisers in that they greatly simplify the computation of the contents of stands. When a lumberman or company buys a tract of timber or are going to log or sell, they usually wish to know beforehand how much timber can be obtained. This is done by cruising or estimating. There are many experienced loggers, land lookers, timber estimators and cruisers who make a business of determining the merchantable contents of timber tracts, and these men are so familiar with trees that determining the board feet in a single tree or giving an approximate yield per acre is second nature to them. Timber cruising cannot be learned from books, for it requires good common sense and judgment, which is obtained only through long experience and practice in the woods. A good cruiser is able to judge by the eye the merchantable contents of trees and stands, by having seen other trees and stands of the same character cut and used, and he knows by comparison, therefore, as to what they ought to produce. He must be familiar with logging conditions, with the defects of trees and the allowances necessary. He must know the cost of logging and other conditions existing in order to ascertain what trees are merchantable from the point of size and condition. For these reasons, and they are apparent enough, books cannot make timber cruisers or estimators.

There are several methods used by cruisers in estimating timber and only one, that used by the foresters, will be considered here. The old-time cruiser usually being in a hurry to get quick results and still accurate as possible, used his eye and judgment. However, this is not the case with foresters, for usually more data is desired and careful surveys are always made.

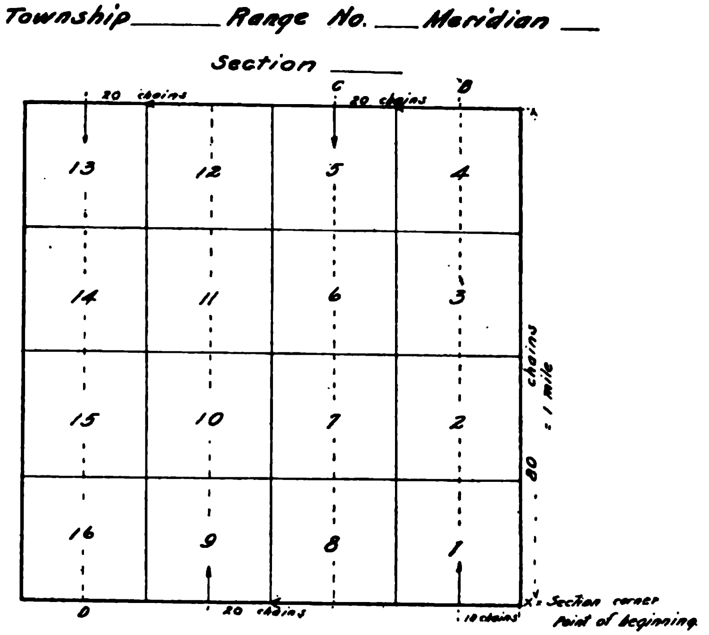
Following is their method, called the *Strip Method*, and it is considered an accurate one:

The principle underlying the use of strip valuation surveys is the measurement of trees in narrow strips distributed systematically over the forest and covering a specified proportion of the total area. In practice of the Forest Service, the strip surveys are one chain, or 4 rods wide, and 10 chains or 40 rods long, so each covers just one acre. If carried on in this manner, the tree measurements and forest descriptions of each acre may be kept distinct.

Four men usually constitute a crew, one man lays the direction of the strip with a compass and carries the forward end of of the chain, two men caliper the trees, and the fourth acts as tail chainman and tallyman; he also makes any necessary descriptive notes. The strip is measured lengthways—that is, stretched on the ground. The trees within an estimated distance of 33 feet (one half chain) on each side of the chain are then calipered and "called off" to the tally man, who records them. Then the crew moves forward another chain, repeating the process until 10 chains (one acre) have been measured. Then proceed until "forty" is finished, which is 20 chains or 80 rods, and then go on to the next "forty."

The Forest Service uses the strip method not only to obtain estimates of the merchantable timber, but also to secure a count of the trees not yet merchantable, to make forest maps and to gather other detailed information necessary to a practical working plan. Under these circumstances, lines of strip surveys are usually laid off parallel and equidistant, and run across the whole tract or as far as the day's work will permit.

The following figure is drawn to illustrate the procedure in cruising a section. It is customary first to locate the tract, which is done by resurveying and locating lines and corners. While carrying on this survey, notes regarding topography and the descriptions of corners found should be kept. Two men usually constitute a "line running" party.



A section contains sixteen "40's" or 640 acres, so for convenience, the "40's" are numbered so method can be followed.

Beginning at the S. E. corner of the section marked x, run a line 10 chains W., which will bring us to the center of the "forty." Now, run N. 80 chains through the "forties" numbered 1, 2, 3 and 4. Having arrived at B proceed to C and then go on as before, going through the remaining "forties" as numbered. When arriving at D in the "forty" numbered 16, run W. 10 chains to "tie in" with the section corner. The latter acts as a check against error in compass work and chaining.

Calipering the Trees.

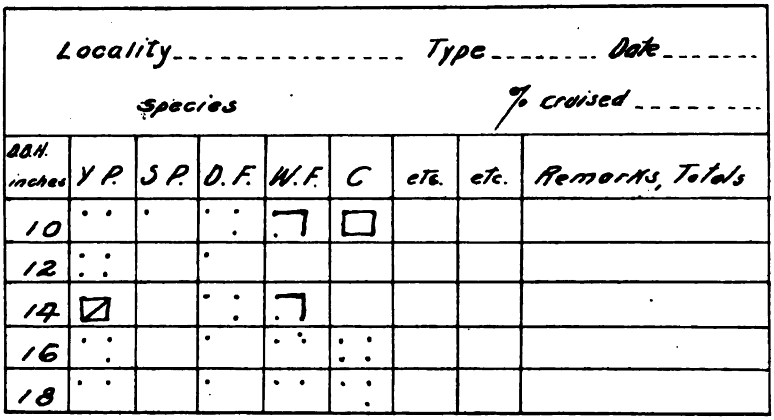
Trees are calipered to the nearest inch at breast high, or the trees may be divided into diameter classes of two or more inches. By diameter breast high (D. B. H.) is meant the measurement taken of a tree at 4.5 feet from the ground and one should be careful and not take diameters below D. B. H. In estimating merchantable timber, only the sound marketable trees are included, because many errors result from counting unsound trees. Great care must be exercised to scrutinize each tree for signs of defect. This is very important for many inexperienced and careless men will measure trees which may appear sound but which really are defective. A cruiser must recognize the external signs, of punk knots, white broken top, or dead limbs for defects.

Recording Measurements.

The diameter measurements are recorded in a tally sheet note book, the tally sheet being ruled in columns: The first column shows the diameter classes by inches or by groups of 2 or more inches, and the other columns are for various species.

The trees are tallied by dots and lines, in blocks of ten.

Following is a sample tally sheet to show methods of tallying.



Locality.................. Type.......... Date.........

Species % cruised..........

D.B.H. inches	Y.P.	S.P.	D.F.	W.F.	C	etc.	etc.	Remarks, Totals
10	• •	•	• • •	┐ .	□			
12	• • • •		•					
14	⧄		• • •	┐ .				
16	• • •		•	• ⁚	• • • •			
18	• •		• .	• •	• • •			

Computation.

Usually the sample strips comprise 5 per cent to 10 per cent of the total area and this fact must be borne in mind when computing the volume of a stand. For instance, if you were to make a 5 per cent estimate, you will have covered two acres out of each forty or 1-20 of the forty, therefore to obtain the volume of the stand, multiply by 20 if 5 per cent and by 10 if 10 per cent and so on.

The computation may very easily be made in the following manner. Make four columns of figures as shown in the form. In the first column place the diameters, in the second, the number of trees of each diameter, in the third, the average contents of trees of the different diameters, and in the fourth, the total contents of all the trees of each diameter, which is found by multiplying together the values in the second and third columns. The figures in the fourth column are then added together for the total contents of the "forty."

Sugar Pine			
D.B.H. inches	Number of Trees	Contents of Tree from Vol table	Total Contents board ft.
12	20	80	1600
14	10	135	1350
16	55	200	11000
18	6	265	1590
Total			15540

Note —
Sample plot, a 5% cruise therefore, the whole "40" will contain 20 × 15540 or 310,800 board feet or $\frac{310,800}{40} = 7.770$ board feet per acre.

Another method and one which does not involve the use of a Volume Table is the estimate by counting logs.

This consists in going over a given tract by strips 4 rods wide (one chain), and their distance apart will depend on the proposition of area to be covered. The estimated top diameter of each merchantable log is recorded as well as the D. B. H.

If a crew of two men, one directs the strip with a compass line and paces the distance, while the other records the diameters of trees and logs. The compass man first paces off a short distance, say, one chain and waits until the tally-man records the trees in that distance and included with a four-rod strip.

The tally-man records the estimated top diameters of each 16, 14 and 12 foot log, their numbers and species. The following table is one showing method used, when only 16 foot logs are considered. Other columns may be added at will to record 14 and 12 foot logs. This may also be done in case D. B. H. and numbers of trees are recorded.

From this data the total contents by species and yield per acre may be determined.

The compass man notes the distance paced, the location of roads, trails, fences, etc., and any other information desired in the cruise. These land features may later be plotted on a map.

Top diameter	Species				
	S. P.	Y. P.	D. F.	W. F.	C
	Number of 16' logs				
6	10		8		10
8					11
10	12	9	7		
12	10			9	12
14	16		6		14
16		5	4		16

Computation.

These notes or records will enable the cruiser to determine the contents of logs by any log rule. They will also give the total number of trees, the average number of logs per tree, the number of trees and logs per thousand and the yield per acre. This method is very good in that you can "cull" cracked and defective logs.

After the total contents have been determined, a certain percentage is deducted to allow for defects.

One must have the ability to estimate diameters by eye as well as have a thorough knowledge of merchantable timber to use this method. It requires a trained eye and in general a good woodsman.

Growth of Trees.

Yield and growth tables play an important part in the determinations which a forester must make. Their purpose is to ascertain the yield and rate of growth of a stand, for in many cases a timberman desires data on the future conditions of his timber.

Diameter of Growth.

Trees grow by adding a layer of wood underneath the bark each year. This growth is termed annual growth, but perhaps more commonly referred to as the annual rings. In many cases they are hard to distinguish making the use of a hand lens necessary. Each ring signifies a year's growth, and the spring and summer wood is different, making the determination of a tree's age comparatively easy. The total age of a tree is shown by the accurate counting of the rings at the ground. Therefore, to determine the age of a tree count the rings on the stump and add the number of rings corresponding to the number of years required to grow as high as the stump. An examination of a number of small trees would give an idea of the time required to grow up to the stump height.

Many trees grow faster on one side than on another, so to get the average growth, determine the average radius and measure and count the rings along it. Then with the rule, this average, (from heart to inside back) is found by trial and a penciled line made. Beginning on the outside, the rings are counted in and a mark made to indicate each tenth ring. Usually the last period at the heart (or pith) will contain less than ten rings. The rule is then laid alongside this radius and the distance from the pith to the first mark entered under 1 (in the following table) putting in the corner of the space the odd years, thus 8-9. The distance from the heart to the second mark is then placed under 2, and so on. The last measurement will be the entire radius and must be exactly half the diameter inside the bark of the tree.

It can readily be seen, that with this data, the diameter and growth per year, ten years or at any period may be determined.

Tree class Dominant *Quality* I, *Crown length* 50, *Crown* Normal

Cross Section.	Distance on average radius from heart to each 10th ring—inches. (Count in, measure out.)															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Stump.	8/ 9	1.5	1.9	24	28	35										
2	5/ 7	1.2	1.7	22												
3	2/ 2	6	13	18												
4	6/ 5	10	15													
5																
6																
7																
8																
9																
10																
11																
12																

Cross Section.	Distance on average radius from heart to each 10th ring—inches. (Count in, measure out.)															
	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
1 Stump.																
2																
3																
4																

Remarks: Crown one-sided.

Form and Condition: Cylindrical and vigorous.

Height Growth.

The height growth is found by counting the rings at different sections (the different logs cut) and subtracting from the rings at the lowest cut. Remember to always add a number of years to cover stump growth.

For example: A sugar pine, 28 inches in diameter and 100 feet high, shows 170 rings on the stump 2 feet from the ground. Add 4 years as the time to grow these first 2 feet. This will show a total age of 174 years. The upper end of the first 16 foot long shows 160 rings; the second 150; the third 135; the fourth 115; the fifth 90 rings. The first 18 foot log (2 feet stump plus 16 feet log) grew in 174 — 160 or 14 years; the first 34 feet (2 plus 16 plus 16) in 174 — 150 or 24 years; the first 50 feet (2 plus 16 plus 16 plus 16) in 174 — 135 or 39 years; the first 66 feet (2 plus 16 plus 16 plus 16 plus 16) in 174 — 115 or 59 years. The first 82 feet (2 plus 16 plus 16 plus 16 plus 16 plus 16) in 174 — 90 or 84 years. The last 18 feet in 174—90 or 84 years. The last 18 feet in 174—84 or 90 years for their growth.

Volume-growth may be determined in the same manner as diameter-growth, the only difference being that the volume must be computed. In this way the growth for the last five or ten years may be determined and in case a future growth for this same period is desired, one may assume the volume in the immediate future to be the same as the last few years.

Another way of determining future growth in volume is to determine the growth in diameter at different parts of the tree during the last five or ten years and assume this growth to be the same during the coming five or ten years. By adding this growth and cubing it, you will have a tree to compare with your present tree. This method is not very accurate and will give too large results unless the volume growth is increasing.

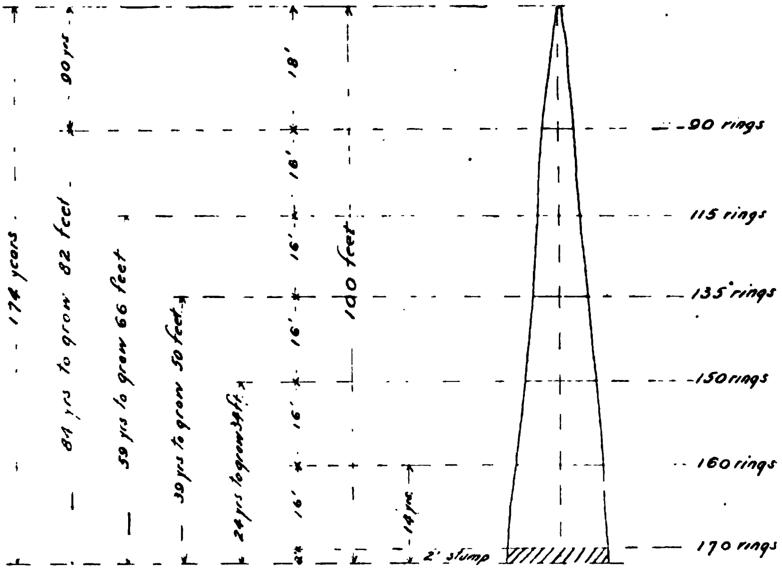


Figure for height growth

YIELD TABLES.

The construction of yield tables as described by Professor H. S. Graves of Yale University is as follows: First, construct for each forest type a table giving the average number of trees of different diameters of the valuation areas. This will represent an average of all the acres surveyed in a given type, and enables one to compute the volume of the merchantable trees above any desired diameter limit, with the use of volume tables.

The next step is to determine the future yield after lumbering. The table shows the number of trees now standing below the diameter limit. This portion of the table is corrected to show the number of trees which probably will be standing at the time of the second cut. One who has a knowledge of logging can easily see what corrections to make.

The table of growth of trees of different diameters is then used to determine the size of trees in 10, 20 and 30 years after cutting, assuming of course, in using the table that a tree of certain diameter will grow at the rate shown, until it becomes one inch larger and that it will then grow at a rate shown in the table for that larger size.

With the above principles in mind, a table is made showing the condition of the stand now, in 10, 20 and 30 years after logging. As an illustration, the following table is made and from which the yield table in its final form may be constructed.

An allowance is usually made for death during and after the first cutting of 5, 7 and 10 per cent in 10, 20 and 30 years respectively.

Computation of yield per acre. Cutting to diameter limit of 12 inches.

Diameter.	Present condition.				Condition in 10 years.				Condition in 20 years.				Condition in 30 years.			
	Number of trees	Volume average tree from volume table, (board feet)	Total volume (board feet)	Annual growth in diameter, (inches)	Diameter, (inches)	Number of trees	Volume average tree, (board feet)	Total volume (board feet)	Diameter, (inches)	Number of trees	Volume average tree, (board feet)	Total volume (board feet)	Diameter, (inches)	Number of trees	Volume average tree, (board feet)	Total volume (board feet)
6 inches	10			.10												
8 inches	7			.125									12.2	3.7	81	300
10 inches	5			.150									14.7	4.8	138	662.4
12 inches	3	81	290	.170												
14 inches	2	120	230	.185												
16 inches	2	175	208	.20												
18 inches	1	240	145													
20 inches	0.3	295	89													
22 inches	0.2	390	78													
Totals	30.5		1,040													

Yield and growth tables, like volume tables, are useless unless used in the locality where made.

Instruments.

The field instruments of common use to the cruiser, or woodsman will now briefly be discussed.

The compass is the most important instrument and is used for running lines, taking bearings etc. in the woods. They vary in pattern and manufacture but the general principle is always the same, *i. e.*, that of having a magnetic needle always pointing in a northerly direction.

The chain, used in measuring distances when surveying, is 66 feet long (4 rods) and is made of 100 steel links, each 7.92 inches in length.

There are also tapes of different lengths used in measuring the circumference of the larger trees, such as the redwoods in California. The diameter of a given circumference may be read direct by reading the other side of the tape.

Calipers are used for measuring diameters, and consist of a beam having a scale on both sides, graduated in inches and tenths. This beam is provided at one end with an arm held in place by a bolt and nut which permit it to be detached for transportation. The beam is also provided with a sliding arm fitted loosely, so as to slide easily over it. To caliper a tree then, slide the loose arm sufficiently to permit measuring the tree. Calipers are usually made of seasoned maple.

Other instruments which are useful are height instruments, tree counters, increment borers, and so on.

A simple method of determining the height of a tree, without the use of a height instrument is as follows: The observer walks to a distance from the foot of the tree about equal to its estimated height. He then lies on his back, stretched at full length, and notes on a vertical staff erected at his feet, the point where his line of vision to the top of the tree crosses. The height of this point from the ground B C (in figure) is measured and his own height from his feet to his eyes A B.

Then $AB : BC :: AD : DE$ or $\dfrac{BC : AD}{AB} = DE$

Example:-

Let AB = 5, BC = 4, AD = 50 Then $\frac{4 \times 50}{5} = 40$

40 = height of tree.

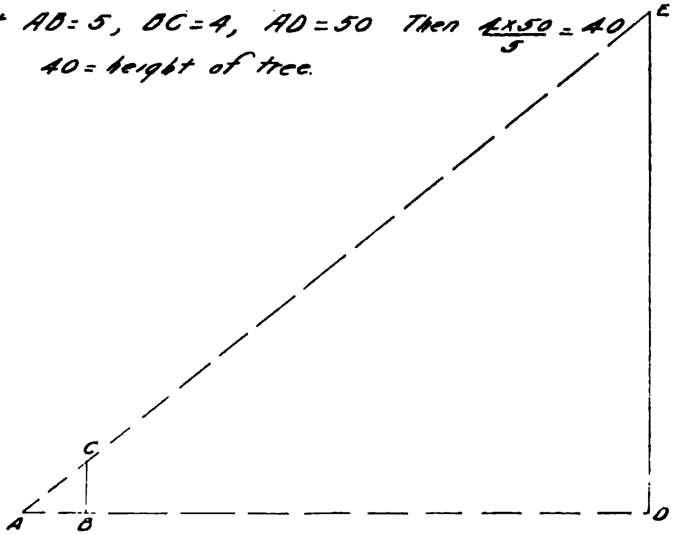


Figure to illustrate the determination of heights without instruments.

CUTTING SYSTEMS.

Lumbering methods as carried on by the present day lumberman are known, from careful examination and study, to be very wasteful and devastating. As a result, the forester sees the need of a systematic plan of cutting or logging standing timber. He not only considers the easiest and most economic way of removing timber but has in mind the results of such a cutting, what the future forest will be like, what species he will have and the yield in salable products. For these reasons, Cutting or Sylvicultural Systems, which are plans of management by which forests are developed and produced, have been advocated. Those of importance, with brief descriptions, are as follows:

I. The Selection System.
II. The Clear Cutting System.
III. The Shelterwood System.

I. The Selection system is applicable to forests having trees of all ages. When cutting, the old and mature trees are selected, leaving the remaining immature trees for protection and development. Thus reproduction is readily secured in the openings made by the cuttings.

The Selection System never clears a stand, but makes only small openings. The principles, however, which must never be lost sight of and which would be simple, if all age classes were represented in proper proportions, are:

1. The rate of growth of a stand must be maintained, and
2. A proper representation of age classes must be continued.

In other words, some definite plan restricting the cut must be followed in order to make the system possible.

II. The Clear Cutting System takes place when all the trees are removed. The entire stand may be cleared in one operation or in several, but the design is to cut the whole stand and replace it with new growth. Some of the conditions requiring clear cutting are:

1. Where there is an even aged stand and the trees are large and mature.
2. When from a financial standpoint (location of logging camps, etc.) it is deemed feasible.
3. Danger from wind fall.
4. Where a clearing is necessary for good natural reproduction.
5. When better species than those in the original stand are desired and which can be obtained artificially.

Naturally, there are many disadvantages to a clear cutting system, such as leaving exposed to the sun and wind the young growth, insect damage, etc., but this all depends on the size of clearings, and therefore large clearings should be avoided as much as possible.

III. Shelterwood System: This system like the others is applicable in different forest types, according as the forests vary in age and reproduction capacity, but usually the method is best adapted to those stands in which the timber is all, or nearly all, mature, where the trees are wind firm and where market conditions will warrant the partial removal of the stand.

The mature stands require a system which will remove the timber in a certain period and replace it with a new even-aged stand. The selection system, therefore, is out of the question, as the principle underlying the Shelterwood System is to remove a stand gradually by a series of thinnings. The opening, in this manner, of the canopy permits the young trees to grow under the protective shelter of the trees left standing.

Many foresters and lumbermen agree that the best method is to remove the timber in two operations, separated by a ten or twenty year period. The first cutting or thinning is intended to secure the conditions required for reproduction and the next, or final cutting, is made after reproduction has been secured.

Some of the advantages in using this system are:

1. It permits the rapid removal of a forest.
2. The poorer grades and decaying timber are used.
3. Good reproduction is secured (insuring a good second cut).
4. The trees left standing will grow rapidly and will enlarge the second cut.

Reproduction After Clear Cutting.

Reproduction is obtained by artificial seeding and planting, or by natural reproduction. Usually, both methods are used: that is, natural reproduction replaces the original stand as much as possible and those areas having scant growth are filled up by planting. Ordinarily, the planting or seeding is done after and not before cutting.

The various methods of clear cutting are:

1. Clear cutting the whole stand.
2. Clear cutting in strips.
3. Clear cutting in patches.

1. Clear cutting the whole stand: This is the method which will be used in this country and consists in cutting an area clear and restocking it artificially. This method is to be used when the area is a restricted one or comprises a large stand of mature timber requiring several years to cut.

2. Clear cutting in strips: Consists in removing a stand by a series of clearings in narrow strips. After cutting a strip it is planted, and after being fairly established the next strip is cut. Thus, no large clearings are made and the young growth is offered protection by the neighboring trees.

3. Clear cutting in patches: Small clearings, regardless of size or shape, are cut in the stand and restocked artificially by this method. From time to time, the clearings are enlarged by strips surrounding these patches and then restocked by planting, continuing with this process until the entire tract is cleared. This is a European method and one which will not be used very much in this country. However, oftentimes this principle is used in combination with the other systems mentioned.

It is often advisable and essential, especially where natural reproduction is to be depended upon, to leave a few scattering seed trees.

Coppice System.

A stand is usually cut clear and applies to species which sprout vigorously after cutting. Reproduction takes place by sprouts from the stumps.

The trees which are most commonly adapted to such a system are: Willow, eucalyptus, maple, birch, ash, chestnut, redwood, basswood, locust, oak, and other hardwoods.

The system is very simple and inexpensive since no skill is required in choosing trees for cutting and reproduction takes place as a matter of course, abundantly and immediately after cutting.

The cultivation of willow is a good example of coppice, and may be handled in a very short rotation.*

BY PRODUCTS.

There is a large amount of waste in the conversion of timber into lumber, ties, and so on. In fact, it has been estimated, approximately, that only 50 per cent of a tree ever goes into merchantable form under present lumbering methods. Manufacturers as a rule try to save and utilize all of a tree that is possible by using fine saws and the most modern improved machinery, but even with such methods, a large amount of waste must necessarily arise. To use this waste profitably, is one of the most important problems now before the manufacturer. Undoubtedly, some day, nearly all the waste which cannot be worked into some form or other will be utilized by chemical means. Those most important now are the destructive and liquid distillation and the pulp industry.

In the Lake States, where in past years so much waste has been produced, numerous experiments have been made with respect to the manufacture of turpentine from Norway pine stumps. The results of these experiments have been fairly successful and improvements are continually being made.

In the distillation of hard woods small trees, limbwood and tops are used. Thus a great deal of the so-called "slashings" or "brush," which are always a fire menace after logging operations, are done away with.

The products from hardwood distillation in their order of importance are: charcoal, wood alcohol, gray and brown acetate of lime, tar and oil. The wood alcohol and acetate are by-products that can be saved only by the use of the most improved processes of distillation—that is, the using of air-tight retorts and the carbonization of the wood (charcoal) by indirect application of heat.

Charcoal, however, can be obtained by almost any carbonization process. At present, in Michigan, most of the wood is carbonized in kilns, in which it is placed and fired directly. With these conditions 4 to 6 gallons of wood alcohol per cord and a small percentage of acetate are saved.

In the distillation of pine two processes are in use, the destructive and steam distillation. The former is similar to that of hardwood distillation in that the wood is carbonized and in this way drives off the oils. The chief products thus obtained are turpentine, tar, charcoal and oils.

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*"Principles of Handling Woodlots," by Henry Solon Graves, is recommended to those desiring a more detailed discussion of Forestry. It was consulted freely in preparing the foregoing.

Steam distillation consists in chipping the wood and then boiling it with live steam. The products contained in the wood are distilled with the wood and come off readily, while the wood itself is not carbonized as in the other process, but is left as a pulp and is used now chiefly for fuel. In the region where Norway stumps are being used, this residue is being experimented upon for its paper-making qualities. So far the results have been fairly satisfactory, and if successful from a commercial standpoint will mean one more important utility for waste.

The products obtained by this method are turpentine and heavy oils. Several of the latter have no commercial value as yet, but the turpentine when refined is considered about equal to gum turpentine and superior in some respects to the turpentine obtained by the destructive distillation of pine as carried on in the South.

Operations at present are confined chiefly to the long-leaf pine belt where the pine gum is obtained, in the states of Alabama, Florida, Georgia, and North and South Carolina.

However, besides the operations that are being carried on in the Lake States on Norway pine stumps, experiments are also being made by the Forest Service with Douglas fir on the Pacific coast. This is of great importance to this region for it will mean not only the utilization of a great amount of waste material, but will provide a market for an entirely new product.

In past years, sawdust has been produced in immense quantities; in fact it is being produced now on the Pacific coast and apparently has no use. Several manufacturers use a small percentage for fuel and in the East these huge piles are being bought by ice companies for ice-packing purposes.

Undoubtedly in the near future, a great deal of this waste will be used in the manufacture of a wrapping or other paper, since the use for ice packing is fast disappearing. Modern ice companies are manufacturing ice artificially as the market may demand and the harvesting, storing and shipping of ice in sawdust as is still being done in many of the northern states is unnecessary.

The above mentioned are only a few of the waste uses and there still is a vast field for improvement. Slab and bark waste, species which can be used for tanning and the waste in lumbering, cutting trees (leaving high stumps), must also be considered.

WOOD PRESERVATION.

In recent years, this question has become an important one to wood users in the country. Especially is it of importance to those using timber for telephone and telegraph poles, fence posts, railroad ties or for other purposes where the timber must come in close contact with the soil. Timber of desired species for these purposes is getting more scarce and rising in value every year, thus necessitating some means of prolonging the life of wood. The different wood using companies are realizing this fact, and some are carrying on experiments for this purpose. Their experiments up to date consist in applying preservatives.

It is a well known fact that thoroughly air dried timber will not decay, because it does not contain sufficient moisture to support the growth of fungi and wood boring insects which are the causes of decay. On the other hand, if the timber is placed in the ground, that portion of it in close contact with the soil will absorb moisture until conditions favorable to decay are restored. To prevent this decay in timber so exposed to moist air and soil, the wood substance, which is the food for fungi growth, etc., must be made immune from such attack. This is accomplished by injecting antiseptics. The value of such a treatment consists in providing an outer protective covering around the untreated interior wood and should penetrate deep enough to prevent exposure.

By the application of preservative treatment, many species of timber not naturally durable and formerly not considered suitable for poles may be used for this purpose.

Treatment.

Creosote seems to be the preservative best adapted to treating woods and this treatment is based largely on the pressure method, where 8 to 12 pounds or more of creosote to the cubic foot of timber is used.

Experiments conducted by the Forest Service show that best results are obtained by first carefully seasoning the timber. Seasoning, therefore, is an important factor and the rate of seasoning will depend largely on the season of the year in which the timber is cut. If seasoned too rapidly the timber is apt to check, whereas timber seasoned slowly and evenly forms numerous small checks, which close again when absorbing the moisture. Checks, therefore, decrease the strength of timber and hasten the rate of decay.

Serious damage from large checks may be avoided by the use of "S" irons.

There are two methods of treatment as applied in preserving poles, these are:

1. The brush method.
2. The open tank method.

1. The brush method consists in applying the preservatives to the surface of the wood with a brush. This form of treatment gives fairly good results but still does not present a complete solution to timber preservation. This method costs but little, in that it needs no expensive apparatus to operate; and again, but little preservative is required.

In the experiments carried on by the U. S. Forest Service, a penetration of from one eighth to one fourth inch was obtained in seasoned timber. In all cases the preservative was applied hot.

Directions for applying preservatives: Fill all season checks with the preservative to guard against decay.

Only poles which are thoroughly seasoned should be treated.

The butt only is treated since it is the portion most subject to decay.

Do not apply the preservative to poles which are wet or damp.

Better results are usually obtained by heating the preservative before applying.

2. The open tank method consists in subjecting the timber to successive baths of hot and cold preservatives. This method like the brush method has the advantage that the preservative may be applied to the butt of the pole only. This avoids the expense of applying it to the portion above ground, which in many cases is durable without treatment.

The three general methods of applying the preservative are:

1. After the timber has been held in the hot preservative for the required length of time, the heating may cease and then allowed to cool.

2. The timber may be transferred from the hot liquid to another tank containing cooler preservative.

3. The preservative may be changed, the hot being drawn off and the cold run into the treating tank.

The open tank method is unlike the brush method in that it is an impregnation process and not a mere coating of the surface with preservatives. This absorption usually takes place during the cooling process, while a hot bath prepares the wood for treatment. The drier the wood the shorter the period of hot bath needed.

These tests were applied to several species of timber, chief among them being chestnut, southern white cedar, western red cedar, lodgepole and loblolly pine. In one instance an untreated pole of southern white cedar showed decay at the end of four years while a creosoted loblolly pine showed no signs after 18 years of service.

There are various preservatives now in use and for general information, a few will be mentioned. They are, tank treatments with—

1. Creosote.
2. Creosote and zinc chloride.
3. Zinc chloride.
4. Crude petroleum.

The Forest Service found after carefully testing with them all that creosote was best. They also came to the following conclusions:

Seasoning of poles reduces the weight 16 to 30 per cent.

Poles cut in the spring and summer lose weight most rapidly.

Of the two methods, brush and open-tank, the latter is best and more thorough, since it prolongs the life of timber for a longer period than the brush method. However, the brush method is inexpensive and with a good preservative may be expected to prolong the life of a pole two or three years.

Finally, it pays to treat timber. There are good grounds for this last statement and for example we will mention a condition existing in Michigan. Here, the railroad companies have been using cedar ties for many years. The cedar supply is now nearly exhausted and for this reason the railroads are buying all the available hard wood ties and treating them with creosote.

A more detailed discussion on wood preservation may be obtained from Forest Service Bulletins numbers 78 and 84.

The question of tie preservation is becoming more and more important as the demand for tie material increases. So long as plenty of white oak ties could be secured the necessity for tie preservation was not felt, but with the constantly increasing use of pine and other woods less resistant to decay, it has become a problem worthy of consideration. The railroad companies have faced the problem by establishing treating plants, and by laying experimental tracks with treated ties to determine the quality of the several preservatives under different conditions.

CHAPTER VII.

A STUDY OF STREET AND HIGHWAY PLANTING.*

(Progress Report.)

At first thought it might seem that the question of "Street and Highway Planting" might be somewhat removed from the general work of the Forestry Department. But that this is not the general opinion of the public, can easily be shown from the great number of queries along this line which are constantly coming into this office. These queries, of course, cover much ground and very often the material needed for a reasonable answer is not at hand or well organized.

Because necessity has demanded that something be done and because popular opinion has turned to this office for help, this study has been undertaken. It has been the first object of the study to gather material throughout the state, and so far the Bay region, Santa Clara Valley and southern California have been studied. This material, of course, has come from many different sources. Many men and women have contributed the fruit of years of work along private and civic lines that we may have the data for general distribution. To them, individually and collectively, we give our heartiest thanks.

Certain fundamentals were always investigated. For each town a species list was kept, in which were noted the trees which commonly occurred in the parkings and any others which in any way appeared as possible candidates or which might have been recommended, whether wisely or not, to our judgment. With each list general notes were taken which contained items concerning their habit of growth, rate of growth, their resistance to drought or alkali, their need of care, peculiar phases of pruning or culture, their needs on the average street and many others which might concern all or particular species of trees. Many of these have been contributed by individuals who have made a study of the trees in their locality and this has been noted, as these matters do not always hold in all vicinities though they may be quite near each other.

Where it has been possible, these facts have been reinforced with photographs with varying success, as some things appear fairly well in a gray and white reproduction which, in reality, are not attractive in any degree.

To some extent, lists of nursery people have been kept from the various towns; these will be filed in the office and may be of help in some cases though the nursery situation in most places is not a serious one.

In each town all these features have been noted, and where it was possible, the problem has been studied from the viewpoint of the officials in charge. In cities where this work is well in hand, the matter has been entered into at considerable length and in those places where it is as yet in its infancy, the general conditions and problems have been studied as they would confront the official undertaking the work. In some cases, as a stranger, some features have been noted not generally thought of but in most cases it has been deemed more discreet to offer the judgment of those who have actually accomplished something, rather than any arbitrary statements from a superficial visit. And by a superficial visit is meant not a light study of the problem, for it has been undertaken in all seriousness and earnestness, but less mature conclusions than could be offered by one who has been on the ground for years and seen the development. And from all our study has come one chief aim (and this, it is hoped, may be a chief result of the study), and that is, consideration and adoption of civic control of municipal planting.

Throughout southern California there is a growing knowledge of the matter of municipal control of street planting. Those cities which have tried the system have shown that great things can be accomplished. Of course the returns of these efforts cannot be directly measured in dollars and cents as the average citizen would perhaps desire, but their return is just as certain though perhaps less noticeable.

At Riverside, the pioneer city in this work, there is a real civic pride in what has been accomplished and justly so. The management at Riverside has been far-sighted enough to improve the parkings uniformly and not pay undue attention to the fine boulevards and wealthy residence streets to the exclusion of the more modest places. With what result? Simply this—that one can go street after street and see almost no cases of unimproved property. And if one should question some householder any objection would be the exception which would prove the generalization, that most of Riverside is pleased with what has been done, and more than proud of its position among the leaders. For, of course, Riverside is not alone. Redlands, Pasadena, Corona, Alhambra, and many other towns have profited by the experience of their neighbor and have gone and done likewise.

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*Final results will be published in bulletin form when the study is completed.

And in those cities which have not entire control of the trees, there was never a lack of information or interest in the subject. In some places the problem is a serious one and one which cannot be undertaken lightly. The realization of this fact is proof that these cities have considered the matter in the right spirit and are going to do the best that is possible when they begin their work.

Riverside, which has been doing systematic planting for many years, both under individual and community effort and in later years under city control, has perhaps the greatest number of trees planted. Pasadena follows closely with many fine plantings. Redlands, which took up municipal control but a few years ago, has made a fine beginning in the work and can boast considerable progress both in new plantings and the rejuvenating of the old plantings fallen into decay. At Santa Barbara there is a lively interest in the matter but as yet the general public spirit is unwilling to give up its individual power into the hands of any board. Certain steps have been taken which give the Commissioners negative powers which are more than useful. At Los Angeles there is no particularly vigorous ordinance and no very rigid enforcement of those existing. As to systematic planting—there is no work done by the city but considerable done by real estate firms. This brings about unfortunate results in many cases, as the selection of species, methods of planting, etc., are not always conducive to the best results. This matter is being pushed, however, both by some of the city officials and enterprising private citizens and many of these hope soon to overcome popular prejudice and gain a desirable ordinance. In San Diego, matters are in a very unfortunate state. Owing to soil conditions and other matters, it has been demonstrated that adequate and sufficient planting would mean a matter of considerable expense to the individual if assessments were made to the property holders. No satisfactory solution of the matter has as yet been worked out.

It should be noted at this point that both Los Angeles and San Diego counties are doing considerable and excellent work along the highways and roads of the county.

As these cities have been visited data has been gathered concerning all the species of trees found growing there which by any chance ever occur in any of the parking spaces. With this data, the opinions of various nurserymen, city officials, horticulturists, and other interested parties have been gathered concerning their personal opinions of each tree. Of course, there is considerable opinion concerning all the points. However, it is our hope to present this data in such a form that intending planters will have tabulated for them opinions of men who have done things. Then by a study of the existing conditions in their own locality and a comparison with those of authority, they may judge whether such a dictum shall hold for them or no.

Also, we have gathered together such information as we could concerning special features of planting or care after planting which have been worked out by officials in different parts of the south. For these we have to thank many interested people who have given freely of their time and of their supply of results to aid this work. To name them all would be tedious to the reader, but they will be certain that their enthusiasm and unselfishness is rewarded in the progress of those around them.

Aside from the work which has been done there will be included a series of suggestions gathered from the experience of Eastern cities. As these conditions are not our conditions, these suggestions are not recommendations, but are merely ideas submitted for consideration. As to whether there is need for them or whether they are worthy of consideration—that is a matter which every municipality must put into competent hands. Some matters which are of prime importance in some localities, sink out of notice in others. This matter of careful and intelligent consideration of local conditions cannot be too strongly urged or too often reiterated. Perhaps in this one factor will lie the entire success or failure of the work done in any one place.

With the eastern material will be some of the legislative acts which have been passed both in the states and in the various cities. In contrast to these we have gathered some of the city ordinances found among the cities visited. Several of the ordinances in use are very good and have proven most satisfactory, while others are indicative of the incomplete state which is to be found in those cities.

In all of the cities visited there was a cordial reception of the idea of a systematizing and collecting of practical data and in each place a real effort was made to show what had been most successful. In addition to the study of the actual planting and caring for the trees, there have been found other short cuts such as municipal nurseries and municipal woodyards. These both have been tried with varying success. The former finds naturally considerable competition and opposition and the latter, so far as discovered, has proven uniformly more popular.

Of these matters more will be said later. And of these matters and all others reported, it is hoped that it will always be remembered that the information offered has been gathered from many different sources. Much of it has been demonstrated and proven whether good or bad; considerable is open for discussion; and much more which is merely tentative. This subject is a growing one and like all others its first years are beset by many difficulties and dangers. It is hoped by this collection of material that some of these dangers may be avoided in the future; that any tendencies which may mature disastrously may be noticed now and checked in their incipiency; that a more common fund of information may be supplied to all interested parties and that a more intimate relation may be built up among those whose endeavors are related.

It is to be hoped that whatever the strain put upon personal feelings in the working out of these "more or less esthetic" phases of municipal life, that those, whose best judgment is in reality the best, will exercise all of their powers to build up a sane public opinion concerning these matters and with a patient effort through a varying length of time build up a spirit which will fruit in civic pride and desire for civic beauty. Southern California has this spirit; do what you can to help it on in your neighborhood and do not hesitate, but push on to the ideal.

CHAPTER VIII.

CONTRIBUTED PAPERS.

Forestry Subjects Discussed by Members of Clubs and Associations.

Such genuine interest has been evinced by the members of various Women's Clubs throughout the state that an opportunity was given them to express their views, through the medium of this report, upon subjects relating to forestry in which the particular person or branch of the club was interested.

A similar opportunity was given to the various associations organized in this state for purposes of forest protection, or for furthering the interests of forestry.

I take pleasure in presenting to the reader the following articles which have been so kindly prepared for this report. I also desire to thank those who contributed the articles, and for their interest and coöperation.

HISTORY AND ACHIEVEMENTS OF THE STOCKMEN'S PROTECTIVE ASSOCIATION.

By JOHN J. CALLAGHAN, Secretary.

Early Local History.

Organized efforts to better the conditions of any portion of the populace produce missionaries who aim to spread their tenets to all whom their efforts may reach. While the notes that follow may, in a sense, be a reflection of personal views, it is my hope that they may in some measure assist others working along similar lines.

We will concern ourselves with that section of the Coast Range lying between Mount Diablo in Contra Costa County and Mount Oso in Stanislaus County, and bounded on the west by the Bay of San Francisco and on the east by the San Joaquin Valley. Fully one half of this district has been devoted to the raising of live stock from pioneer times. Until the advent of the railroads, the occurrence of range fires was very infrequent, although forage had accumulated after favorable seasons. With the great increase of population in the bay counties in recent years and the advent of the care-free hunter from the nearby towns, the menace became intolerable and many range men thought to abandon an uncertain means of livelihood.

A denuded range, with timber, cordwood, fences, dwellings, and forage swept away in a few hours time, will not in this section of the State produce under normal conditions, an average blanket of grasses for fully three years—certainly no profitable investment. Some few years ago during the summer nights, the residents of the valleys and towns could frequently view long lines of fires sweeping over the ranges, like battle scenes; beautiful panoramas, but as I will later demonstrate, injurious alike to them and the range owners. Lacking organization, the ranchman would wait until a wall of fire bore down on his holdings and then would make spasmodic efforts to check it's course, often without avail.

Local Stockmen Organize.

On May 15, 1904, a number of stockmen from Stockton, Pleasanton, Midway, Tracy, and Livermore met at the latter city and organized the "Stockmen's Protective Association," as its by-laws soon after adopted very aptly state, "*to promote the stock and range interests of its members, especially for protection against range fires.*" Although members have been assessed but one dollar a year, the association to-day represents over 250,000 acres of land in Alameda and San Joaquin counties and an investment of fully $3,000,000. Officers have since been elected annually and competent committees have achieved splendid results in many measures undertaken.

A spirit of coöperation within the ranks of members boded well for the young organization. The poor homesteader and large landowner have worked in harmony for a common cause, and, I make no idle boast in saying the personal differences in other matters have not entered here. They are builders looking for definite results.

The Policy of the Association.

The association has from its founding until the present time positively prohibited hunting, camping and trespassing on the lands of its members during the dry season. A uniform form of notice is posted, and, in places has been translated to a foreign tongue. The committees on by-laws and legislation have always secured the assistance and coöperation of the State Forester and the various county boards of supervisors with whom they have had to deal. Committees appointed to investigate fires have, by vigorous efforts, collected many thousands of dollars in damages for members without resort to legal actions.

Local Coöperation.

It is at all times unpleasant to tell your banker, your grocer or other business associate that he can not hunt or camp on your range, though he be most careful in the use of fire or firearms, yet, to maintain a necessary policy, no exception can be made; but, on the other hand, the banker should realize that the rangemen must prosper that he may pay his loans and increase his deposits. So, too, that grocer can not do otherwise than assist that hillsman so that his credit may be good at the store.

As the business community is mutually dependent, therefore, assistance should be given the rangeman to improve the conditions of his business. We increase the volume of trade and aid the entire community by such unity of action and mutual aid.

The clubs established in the hill sections by business and professional men of neighboring cities post notices that their guests may not trespass on our ranges. In line with its policy to promote local industries, the Livermore *Herald*, edited by Arthur L. Henry, has given our work such publicity that from that source alone the local public generally has been brought to a realization of the difficulties that beset us.

Fires and Insurance.

Work directed in turn by State Foresters Allen, Lull, and Homans, has reduced range fires locally to a minimum. All parties recommended by the association in Alameda, San Joaquin, and Stanislaus counties, have been appointed State firewardens by these officials. Blasting operations have been supervised and burning permits granted.

Though our members have secured thousands of dollars in settlements of damages for fires leaving the railroad right of way, we find it far more expedient to compel railway corporations to burn their right of way than to await the outcome of controversies with claim agents.

As a result of the rigid patrol, backed by State and county and the good will shown by citizens generally, some standard fire insurance companies write policies on grazing lands in this section. With the protection afforded, they rate the risk a safe one and a good investment, and fully 75,000 acres of land are now insured.

Mounted Patrols.

Five mounted patrolmen cover this district at the present time, reporting regularly to the county firewardens and the State Forester. The men were recommended for appointment as county and State firewardens by the association, by ballot of members.

Realizing that the closing of our ranges resulted in the propagation of deer and valley quail, the State Fish and Game Commission has, as well, appointed them deputy fish and game wardens. These men report daily at certain designated stations.

Legislative Measures.

Committees have approached the boards of supervisors of Alameda and San Joaquin counties, petitioning for appropriations for a system of fire patrols. The demands have been made from an economic point of view and coming from a large body of taxpayers, the officials have realized that such appropriations were good investments of public money. The necessary grants of funds have been made, thousands of dollars' worth of assessable property has been saved from destruction and live stock has remained in the counties interested, to be again assessed and add to the volume of trade.

Coöperative Measures.

Some days since, President John McGlinchy of the association received from the Oakland Chamber of Commerce a tender of any services that could be given and a request for the association to reciprocate. I can not impress too strongly the value of unity of action.

I believe that associations of range owners should be instituted throughout the State. Each unit could be a county or two. Local and topographic conditions would define the area that might be covered, and yet, not prevent concerted and effective work. Such associations could federate in due course.

I would strongly urge interested communities to coöperate with the State Forester's office in order that some uniform scheme of statewide organization may be effected, as well as with the various county officials. Such a scheme could only result in harmonious action in accord with conservative legal procedure. Where county revenues are insufficient for this purpose the State Forester should urge the necessary legislative appropriations.

In Conclusion.

While there are 27,000,000 acres of Federal lands in California, the lands under State control are equally extensive. The industry that produces the meat products required by our people should, for the well-being of the commonwealth, be better organized along these lines. While some good is being done, we lag far behind other elements of the people. Legislators and thoughtful citizens who would deal with the conservation of water and forest should likewise, as trustees for the generations that follow us, safeguard our highly valued brush and meadow lands for their peculiar uses.

TRI-COUNTIES REFORESTATION COMMITTEE.

San Bernardino, Riverside and Orange Counties, California.

By FRANCIS J. CUTTLE, Chairman.

This committee is composed of twelve representative men from each of the counties of San Bernardino, Riverside, and Orange. It was permanently organized in January, 1907.

The purposes of the organization are as follows: "To diminish the winter and spring run-off and increase the summer flow of water from the San Bernardino watershed—

First—By securing to the Federal Government the ownership of all lands within the outside boundaries of the San Bernardino Forest Reserve.

Second—By preventing the further destruction of timber and brush within the said reserve.

Third—By reforesting all denuded areas.

Fourth—By afforesting, where practicable, all areas not now covered with sufficient timber to conserve to the best advantage the precipitation falling on the said reserve."

The organization is the outgrowth of a movement among the chambers of commerce of the three counties above mentioned to prevent the destruction, by fire, of the chaparral and other growth on the watershed from which these counties secure water for domestic use and irrigation. Before the permanent organization was effected, a committee had been appointed by the Riverside Chamber of Commerce to secure coöperation between the water users and the Federal Government for the protection of the watershed from fire. Through this committee, since its organization, the people who secure water from this source of supply have been and are now in constant touch with the Federal and State authorities who have charge of this watershed. During the past five years nearly $50,000 has been expended in the construction of fire lanes and trails for the purpose of enabling the forest rangers and auxiliary forces to patrol the watershed to prevent forest fires or extinguish them in their incipiency. The expense of doing this work has been largely paid from the Federal and State treasuries, although the committee has raised some funds toward this work and at the present time is paying the salaries of two extra forest rangers to secure better patrol of this watershed during the dry season. Only one disastrous fire has occurred during the past five years, and fortunately that was on a portion of the watershed from which the least amount of water is secured for domestic and irrigation purposes.

Committeemen from each county are selected to serve one year or until their successors are elected. Meetings were originally held four times each year, but during the past year this has been changed so that three meetings are now held each year, one in each of the counties having representation on the general committee.

An auxiliary organization, known as the Water Conservation Association, has also been perfected through the work of this organization. It is incorporated under the laws of the State of California and has the power to purchase real estate and carry on general business of a water company. Since its incorporation this association has purchased about 600 acres of land, or rather, gravel and boulders, and has secured the withdrawal, by the Federal Government, of about 1,100 acres more in the gravel wash bed of the Santa Ana River, immediately outside of the National Forest, where the fire lanes and trails above referred to were constructed. These lands lie at the base of the San Bernardino Mountains. On this 1,800 acres of land a very complete system of open ditches has been constructed for the purpose of distributing storm water during the season of run-off which occurs in this locality from December to April first. These lands are located from four to five miles due easterly from the San Bernardino artesian basin and from 400 to 500 feet above the basin. The sinking of water on this débris cone has been carried on for the past six or seven years, although only on a large scale for the past two or three years, during which time about 10,000 inches of water is sunk each year for probably a hundred days. This work has been carried on long enough to bring about very definite and beneficial results in augmenting and sustaining the flow of water from the streams having their rise in the San Bernardino artesian basin, and also from artesian wells. During the irrigation season of 1911 two companies having their source of supply in the San Bernardino artesian basin secured approximately 1,000 inches more gravity flow than prior to the sinking of this water on the débris cone, and that, notwithstanding the fact that the rainfall had been decreasing for four or five years preceding the summer of 1911. The stream flow, as well as the artesian flow from the easterly portion of the San Bernardino artesian basin, has been remarkably good for the season of 1912. although in the northwesterly portion the water has been very low, indicating that there may be some underground barrier between the easterly and westerly portion of the artesian basin preventing the westerly portion from receiving benefit from the spreading of storm water on the débris cone on the easterly portion. This, of course, is only a supposition. This project is now being thoroughly investigated by the Federal Government at the request and expense of the State Conservation Commission. to ascertain definitely and authoritatively just what benefit is being derived from the spreading of this storm water. Practically, the people who are carrying on this work are thoroughly satisfied with the results. These people are a unit in their desire to have better protection from fire on the watershed from which they secure their supplies.

Attempts have been made at reforesting and afforesting areas on the south slope of the San Bernardino Mountains. but so far without any marked success. Indications are that very little large timber has ever grown on the south slope of the San Bernardino Mountains, it being covered with a dense growth of chaparral. Investigations are also being carried on to ascertain the amount of run-off on that portion that was burned over during the immediate future years. This will be compared with the run-off after the watershed has been naturally covered by a growth of chaparral, such as existed before the fire. This, of course, will take a series of years to determine whether or not the chaparral prevents the rapid run-off of precipitation at the time it falls, and if so, to what extent, but it is believed that the expense of carrying on these experiments may give some definite information on the subject that will justify the experiment.

In closing, it might not be out of place to mention that since the great fire of 1911, which burned over approximately 12,800 acres, contracts have been entered into between the Forest Service and water companies and other organizations in the neighborhood, whereby these organizations maintain supplies and furnish, on an hour's notice, from 25 to 50 men each to fight fires in case of emergency. During the past year a portion of these emergency forces have several times been called upon. They have responded with such promptness and good effect that several fires which might have grown to disastrous proportions have been put out immediately after starting. Auto trucks are used to take these men and supplies to the scene of action and the plan seems to enable the Forest Service to have at its command reliable working forces almost as promptly as the chief of a fire department in a city can summon the firemen to the scene of the conflagration.

CLUB WOMEN AND FORESTRY.

By Mrs. Foster Elliot,

State Chairman of Forestry, California Federation of Women's Clubs.

When first beginning the study of forestry in connection with Club work, one is fairly overwhelmed with the immensity of the subject, and feels perchance a touch of reproach at one's temerity at even approaching this great line of work.

This feeling soon passes away, however, and the more one studies into this great question, the more interested one becomes, and believes that small endeavors from each section, united in one great activity, give untold help to the whole Forestry movement.

Surely this great movement for forest protection is one of the most important of the problems before the American people to-day, and our future welfare depends upon its working out. As women are vitally interested in all questions that affect the home, they fully realize "that almost every industry is controlled by forest preservation; useful, ornamental and industrial arts depend upon the output of the forest. In this line of work, woman proves she can reach a result as quickly by reason as by intuition, and her influence is felt everywhere in this movement in civics and forestry."

The Conservation Department has become one of the most important in our great federation. At first it was called "The Forestry Committee," being organized to help along the forestry work, and for some years labored along that one line. Later, the preservation of bird life entered into the place, because of its close relationship to forestry. We have a saying "No birds, No Forests; no Forests, no Birds." Again, later, at the suggestion of the Woman's National Rivers and Harbors Congress, a waterways department was added, and two years ago the name was changed from Forestry Committee to Conservation Department, and, ever since, these two great issues have gone hand in hand.

Perhaps nowhere in the United States is the welfare and prosperity of the people so dependent upon the preservation of the forest cover as here in California. California has always suffered from forest fires. The Indians, sheepherders, settlers, and campers have all been responsible for the forest destruction. Some time ago a series of dry years, accompanied by disastrous mountain fires, brought the people of California to a realizing sense of the danger to the water supply, and consequent check to the growth and development of the country, unless proper means were taken to stamp out the recurrence of mountain fires. For many years an active educational campaign in the interest of conservation has been carried on.

In this great work the club women of California have done their share. While many live in cities, still more live in small towns, or on ranches, but wherever they are, they know and believe that wood is one of the prime necessities of man and "We must save the forests."

The club women of California count no small part of their work to have been along the lines of education; perhaps we will never know just how far-reaching it has been. The successive state and district chairmen have given freely of their time and talents, have addressed clubs and schools, written thousands of letters, distributed literature, written articles for the newspapers and in short have done all in their power to stimulate interest in forest preservation and water conservation.

This last year much instructive work has been done through the medium of talks illustrated by lantern slides loaned by the United States Forest Service. These slides have done untold good, especially among the school children, the pictures showing most widely the economical value of forests, their protection, esthetic and sanitary influences, waste and destruction in the forests, and what is being done to remedy these conditions. These slides were shown at the Whittier State School, and the close attention paid, makes us hope that the girls and boys will receive lasting benefit. Everywhere the emphasis has been laid on the need for fire protection, and during the coming year the slogan will be "The Necessity for Fire Control."

Through the strenuous efforts of the Women's Clubs, in many sections, valuable trees have been saved from destruction; in others, planting of roadside and school grounds has been carried forward and encouraged—parks planted to trees and maintained.

Some clubs have urged their supervisors to appoint a county board of forestry, who shall have the right to supervise the planting of trees along the public highways. In Los Angeles County such a board has been created, with two of its members women, and already some forty miles of roads have been planted to trees and palms. One district has accomplished legislative work of permanent nature, for the following bill, drafted by one of its members, passed the state legislature and became a law.

"March the seventh of each year, being the anniversary of the birthday of Luther Burbank, is hereby set apart and designated Bird and Arbor Day. All public schools and educational institutions are directed to observe Bird and Arbor Day, not as a holiday, but by suitable exercises having for their object instruction as to the economic value of birds and trees, and the promotion of a spirit of protection towards them."

For more than nine years the people of California, particularly the 500 women of the California Club, worked to interest the Government in protecting the Big Trees from destruction. At last they were successful, for by an act of congress, passed February 18, 1909, a way was found to save for all time one of the most famous groves of trees in the world—the Calaveras Big Grove of California. In the years 1910–11 in addition to all the educational work, study and tree planting being done by the clubs, general forestry work was accomplished both for our own state and the eastern states. Thousands of letters were sent from California to our representatives in congress asking them to vote for the Weeks bill which would establish national forests in the White Mountains and Southern Appalachians for the protection of navigable streams. On the other hand, at our appeal the eastern club women sent thousands of letters to our representatives asking them to revoke the grant of the Hetch Hetchy Valley to San Francisco, while here at home we were not backward in our efforts to save this beautiful valley for the people. We hope and believe our work had some effect, for both of these measures carried. Perhaps nowhere are there more national parks and national monuments than in California, and the Women's Clubs have always listened to all appeals from organizations, and coöperated with them in all measures for the preservation of these National and State playgrounds, not only for to-day but for their great value to the coming generation.

At the Annual Conventions of the California Federations, resolutions have been adopted thus:

At Del Monte, May 1909, against the proposed grant of the water right in the Hetch Hetchy Valley to the city of San Francisco.

At Santa Barbara, May, 1910, in favor of resolution presented by the Women's Clubs of the New England States asking our women to work in favor of the passage of the Weeks bill.

At Paso Robles, May, 1912, for the control of forest fires, and also a resolution in favor of the National Conservation Exposition to be held in Knoxville, Tennessee, in 1913, and the bill before congress to provide for a Government exhibit in the same. At the eleventh biennial General Federation Women's Clubs at San Francisco, June-July, 1912, a protest against any further curtailment of the national conservation fund, and a sufficient appropriation be made to secure our forests against fire.

The club women of the State are also working hard to induce congress to acquire and set apart for a National Park a tract of redwood timber in Humboldt County where the finest redwoods are fast disappearing, and they fear unless quick action is taken these splendid trees will be lost to this and future generations. We feel that what we have done is appreciated. We have received splendid suggestions and practical and valuable assistance from the United States Forest Service, and from the State Board of Forestry, and in return we have done, and will continue to do, all in our power for forestry. State Forester Homans has suggested that the Women's Clubs conduct a publicity campaign against forest fires, and from Washington we are asked "to further the introduction and improvement of courses in forestry in schools in connection with other subjects such as agriculture, nature study and geography." Surely, if we can do real practical work along these lines, we shall feel at the end of the coming year as if we had accomplished much, and had not labored in vain.

As we are so vitally concerned in the future of forestry in the State—knowing that "back of our homes with their ornamentations, lights, heat, and culinary departments lies the forest, back of the very stability of the National Government itself, lies the forest"—we would therefore like to make a few suggestions as to what might be done, not only to protect the forests now standing, but to insure something as well for the coming generation.

We recommend that a sufficient appropriation be made by the State for the acquisition, by purchase, of land for reforestation purposes, for the management and control of same, for the prevention and control of forest fires, for a paid fire fighting force to coöperate with the United States Forest Service; for the purchase of seeds and seedlings for distribution among the farmers of the state in order to encourage tree planting. That the appropriation for printing and binding be sufficient so that the material collected by the State Board of Forestry may be sent to the people, for research work is of little value unless it can be distributed.

Also we believe in a more equitable basis of taxation. Until that end is attained, and the State offers inducements for planting by not urging taxes on timber lands until the timber is ready to cut, we fear there will be very little reforestation by private owners.

We feel sure there is no one woman who has done more for the cause of forestry in California than Mrs. Lovell White, and this article would have little value if there were not some word from her incorporated in it. She sends the following report; we only wish it were longer, but fearing to make it too long she left out the splendid work she has done:

"The biennial meeting of the General Federation of Women's Clubs was held in San Francisco, beginning on June 25th and ending on July 5th. The Conservation Department of General Federation of Women's Clubs includes committees on forestry, waterways, and birds. Other popular features, notably good roads, were presented by the chairman of the department on Thursday, July 1st, when the morning session was given up entirely to the presentation of the subjects above enumerated. The program was unusually fine and a large and enthusiastic audience greeted the speakers from the different states. Both women and men showed a familiarity with their themes, and also a genuine eloquence in dealing with the various phases of the subject.

A conference on forestry attracted a large audience on the afternoon of the same day. The conference was informal, questions were asked, including topics ranging from forest fires to the best manner of disposing of cut brush. The walls of the room were lined with photographic exhibits from Massachusetts, Pennsylvania, and California.

A chairman from every state was appointed to serve on the Conservation Department by the Governing Board of the General Federation of Women's Clubs. The duty of said chairman is to make herself familiar with all the conservation conditions of her state, through the medium of the clubs belonging to the federation of her state.

In this way she can secure information on every point needing exploitation. For the convenience of the state chairman copies of a leaflet containing fifteen questions relating to forestry in general were forwarded to them. These were circulatd throughout the Union. The responses were numerous, showing care and intelligence in the compilation of data. In many instances the state forester had prepared the material.

Many of the states have tree wardens instead of foresters—the duties, however, being similar. The primary principles of forestry are taught in many of the public schools throughout the country. The impression conveyed after reading all the reports sent by the state chairmen is that forestry in the hands of club women is simply of an educational character, confined to lectures before organizations by experts on the subject and to study classes under a leader familiar with the best books written on forestry. The beauty of trees, the poetry and romance of the forest seemed more appealing than questions of practicability.

Few possess state parks planted in native trees. In that respect California shone with splendor—as Redwood Park, consisting of more than 3,800 acres of land, is probably the most extensive and wonderfully wooded state park in America.

The chairman of the forestry committee gave as her part of the morning program on July 1st a description of our parks—including the State Redwood Park—our National Parks, National Forests, and our National Monuments."

In conclusion, we agree with Mrs. White when she says "that women's work in forestry is mainly educational." This work had to be done, however; there is still great need for it, and after all, have we not laid the foundation for the practical work which everywhere is being carried out? We hope and believe, the California Federation of Women's Clubs is proving itself an important factor in the cause of forestry. We urge the importance of fire control, and also how necessary it is that what remains of our original forest area, should be administered under the principles of forest science.

FOREST PROTECTION.

By Sarah L. Bowden,

Chairman, Forestry Committee, Out Door Art League of Santa Clara County.

The suppression of forest fires is a matter that every member of the Out Door Art League of Santa Clara County feels of paramount interest and importance; and, either as individuals or as a body, will give any help possible in an educational or legislative campaign for the effective prevention of forest fires.

San José is situated in such close proximity to our beautiful wooded hills and cañons, and to the State Park—only forty miles from the Big Basin—that we feel a special interest in their preservation. Moreover, some of our members are among the most ardent tree lovers in the State; and no more acute pain could come to them than the knowledge of the abuse of camping privileges in our woods.

We are fully aware that under no circumstances is a forest fire of benefit, either from an esthetic or economic point of view. The injury to young timber and yearlings is inestimable, and the burning of dry grass and waste vegetation cannot be a compensation or at all desirable. Timber dealers and lumber companies no longer find it economical to burn over the land from which a sawmill has been fed. Of late years a market has been found for all so-called waste.

The conservation of our forests is now becoming a matter of popular interest. Much is constantly appearing in print regarding it and the educational campaign in that direction grows stronger yearly. We are glad to refute the oft-quoted statement that the Indians found it beneficial to deliberately burn out the undergrowth of the forests at stated seasons. The Indians did have such methods, but they did not conserve their forests; nor was there any need for their doing so, when there was such an abundance of timber and such sparse population. This knowledge is gospel to us of the Out Door Art League. We take every opportunity to disseminate the facts, and to contradict erroneous theories to the contrary.

In the matter of practical work, the Out Door Art League had a representation in Sacramento, and used its influences for the passage of the forestry bill two years ago. Letters were sent by the league to every member of the legislature during its last session, urging the passage of the bill providing for the appointment of a firewarden.

This summer our committee on forestry had an article on the danger of forest fires, with warnings to picnickers and campers, printed in the San José *Mercury;* copies of this were sent to every paper in Santa Clara County, many of which reprinted the article with editorial comment.

In order that forest fires may effectually be prevented there must be a systematic campaign of education inagurated and continued until the importance and necessity of the work shall be made apparent to all. Such work is conservation in its highest and most practical form. It is essentially state work. Hence the Out Door Art League of Santa Clara County favors every well considered measure that will result in the prevention and suppression of forest fires within the State of California and is ready to endorse and support any legislation that will result in protecting and conserving our magnificent forests, the greatest asset of our beautiful California.

NATIVE GROWTH FOR PLANTING IN CALIFORNIA.

By Miss E. Porter,

Out Door Art League of Santa Clara County.

"My position has been that the woody flora of any particular region is, and must ever be, the one criterion in the determination of our choice of material." (Professor Macbride, University of Iowa.)

The trend of the times is toward the preservation of natural beauty. National, state and city parks make it possible to retain much wild, unspoiled nature, of which we stand in such need. Outside these park areas, it is difficult in the march of civilization, with its manifold industries and occupations, the building of railroads and the making of homes, to preserve natural beauty. But there is the widest desire for it everywhere manifest—among landscape architects, real estate men, public officers, railway officials—and we believe that the more closely nature is studied and her counsels heeded, the less difficult the problem will become.

THE HARMONY OF NATURE.

Nature has covered the architectural foundation—the mountains, cañons and plains—with growing things which are not only in perfect harmony with the structure which they adorn, but with each other. It is possible to destroy the beauty of the landscape, not only by the destruction of this native growth itself, but also by the introduction of foreign growth into its midst, a fact not so widely recognized.

FORESTRY EXPERIMENTS.

In this connection, recent experiments in the Forestry Department are interesting and very encouraging. Where eucalyptus trees have been planted on the lower slopes of the mountains, in southern California, they have not made as satisfactory protection to the watershed as the native chaparral. Even the pines removed from mountain heights to these lower levels do not thrive as well. So it has been decided that in the Forest Reserves, at least for the present, that the manzanita, the buckthorn, the sage, and the wild buckwheat are to remain, clothing the unmarred hillsides with their lovely bloom. It is suggested further, by one writer, that the Government be asked to "reforest" the slopes already denuded, with honey-bearing plants, for the benefit of the beemen. If a useful industry can thus be carried on, at the same time protecting the watershed and preserving characteristic natural beauty, it will be one step toward an ideal civilization.

It is encouraging that the Bureau of Forestry believes it will pay to hold cut-over redwood lands for future crops, which will also aid in preserving the original landscape.

UNNECESSARY PLANTING.

In the making of homes in regions of great natural beauty it would seem desirable to alter the surroundings as little as need be, planting only to restore where nature has been disturbed. But even in summer camps one sees much effort expended in artificial gardening, all out of harmony with the delicate blooms and rugged forest trees. Of course where the home is permanent, and architecture more pretentious, and the need of formal gardening is felt, it is possible to separate the artificial from the natural surroundings, and so prevent incongruity.

It is a pleasure to record here that Mr. F. A. Hihn and Mr. Frank L. Brown in Santa Cruz County, Mrs. Lillian Ferguson in Marin County, Mr. Charles K. Field, and others are helping to restore the characteristic beauty of the redwood region by the planting of these young trees about their homes.

CHARACTERISTIC NATURAL BEAUTY.

Each region has an individual charm produced by its native trees, shrubs and flowers. Even under artificial conditions, by using the native growth for planting, this characteristic beauty is in a great measure preserved. The native elms and maples that shade the streets and highways of New England have their appropriate quiet beauty; the royal palms forming the approach to Cuban haciendas have a tropic splendor in keeping with the landscape; and the moss-draped native oaks that lead to the old plantations of the south have a distinctive beauty that no foreign trees could give.

In Italy eminent men are urging not only the restoration of the classic native growth, but also the "removal of the new and inharmonious." The Italian Government is to restore some of the buildings of ancient Rome and surround them with a magnificent park. Already thousands of young trees have been set out, but only natives of the soil—the laurel and the ilex, the olive and the pine—have been chosen.

Our greatest landscape architects realize the value of characteristic beauty, and the folly of attempting to transform one landscape into another of a totally different kind. Only a few days ago in Denver, William Law Olmsted said (and there is perhaps no higher authority) "we should not try to imitate Eastern landscapes."

The charm of variety is not attained by assembling many kinds of inharmonious trees and shrubs together, but by emphasizing the characteristic growth of each region.

We Californians, a cosmopolitan people, are slowly learning that our architecture and landscape art, as well as mode of dress, must be formed by the natural conditions of the State in which we dwell.

Plants brought from even Arctic regions would in time, no doubt, adapt themselves to new conditions, and grow into harmony with their surroundings, but why should we force nature to repeat her patient processes, when the decoration she has already prepared is so perfect and so beautiful?

TOPOGRAPHY OF CALIFORNIA AND HIGHWAY CONSTRUCTION.

In order to bring the topography of the State clearly before the reader's mind, we quote from the opening chapter of John Muir's "The Mountains of California."

"Go where you may within the bounds of California, mountains are ever in sight, charming and glorifying every landscape. Yet so simple and massive is the topography of the State in general views, that the main central portion displays only one valley, and two chains of mountains which seem almost perfectly regular in trend and height: the Coast Range on the west side and the Sierra Nevada on the east. These two ranges coming together in curves on the north and south inclose a magnificent basin.

"This is the grand central valley of California, the waters of which have only one outlet to the sea through the Golden Gate. But with this general simplicity of features there is great complexity of hidden detail. The Coast Range, rising as a grand green barrier against the ocean, is composed of innumerable forest-crowned spurs, ridges, and rolling hill-waves which inclose a multitude of smaller valleys; some looking out through long, forest-lined vistas to the sea; others, with but few trees, to the central valley; while a thousand others yet smaller are embosomed and concealed in mild, round-browed hills, each with its own climate, soil and productions."

Through this varied and beautiful country the state highway is to pass, and many new county roads are projected or in course of construction. To construct and plant

PLATE XI. Native sycamores on Penitencia Creek road, Santa Clara Valley.

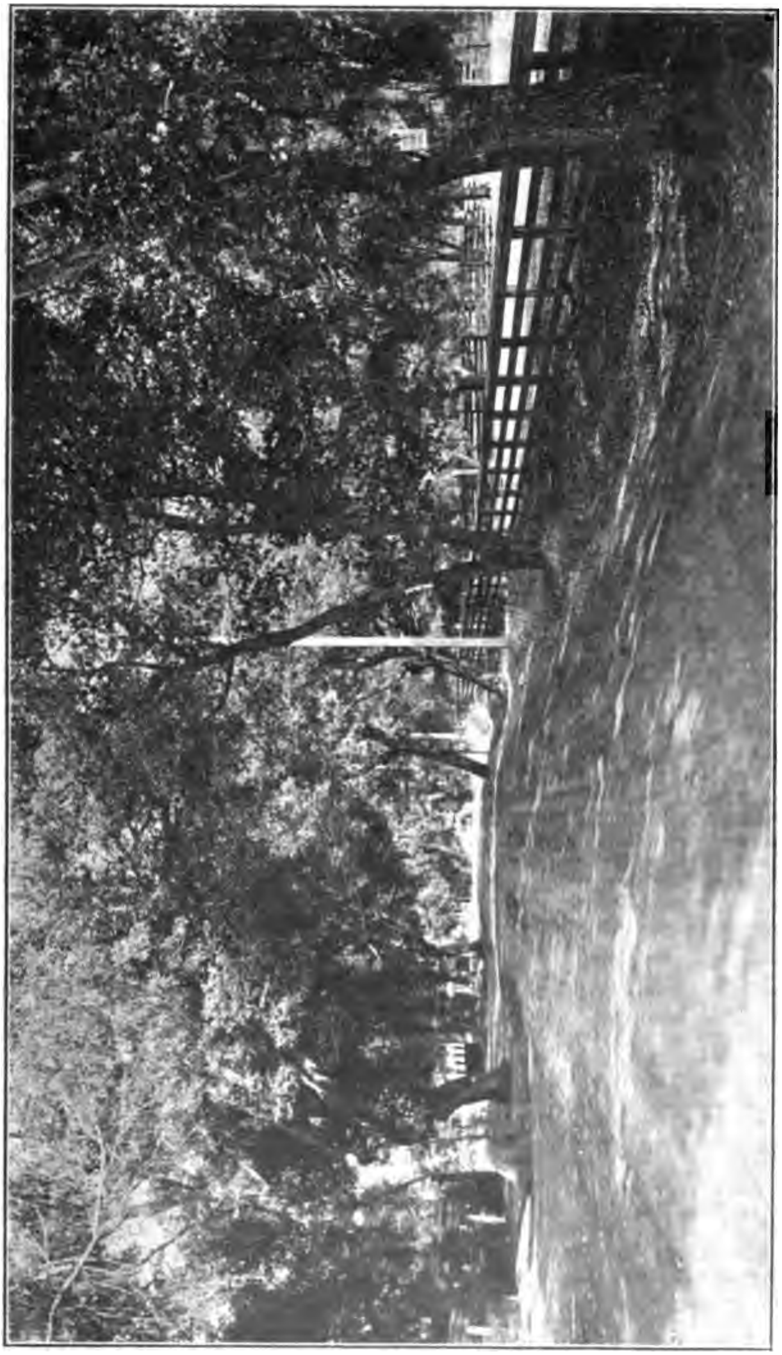

PLATE XII. Native liveoaks on roadway near Palo Alto. Help to further efforts looking toward the preservation of our roadside trees.

these highways, as well as those already made, so that the beauty of the landscape as a whole shall be preserved, is the difficult problem presented.

PLANTING ON MOUNTAIN ROADS.

When the road must penetrate mountain gorges or find its way among the rolling hills, skillful engineering is required to preserve the contour of the land. But in the way of planting only restoration is needed—covering scarred banks with native vines and shrubs which strengthen while they adorn—reforesting with native trees where blackened stumps show that forest giants once stood.

WATERWAYS.

When the highway at lower levels follows where cool alders fringe the stream, or where sycamores define it with their gleaming trunks, where willows bind the banks and make the low-lying country beautiful as the waterway draws near the sea, art and nature counsel "Plant only to restore."

COAST VALLEY ROADS.

When the road winds among the liveoaks of coast valley floors, there seems no question still of introducing foreign growth. What could be more satisfying than such "nature-planted" roadways? And to scatter these trees "whose rounded outlines are repeated in the soft curves of the foothills" along the intervening roadway, linking grove with grove, would seem the logical treatment, if we are to preserve the distinctive charm of the original landscape.

It is true that oaks are comparatively slow growing, but even when no more than shrubs they are very decorative. With proper care the young trees make a surprising growth, and in thirty years a man may stand under a fair sized liveoak of his own planting. But, after all, are we to plant only for ourselves, and give no thought to future generations? It would seem our duty to at least repair the natural loss among our native trees, thus securing the permanent character of the landscape. Besides the esthetic value, there is the historical association and sentiment which are well worth considering.

EXAMPLES OF WRONG PLANTING.

There is no more striking example of unwise planting than parts of the road leading down the San Francisco Peninsula, the old Camino Real which is to be incorporated in the new State highway, where lines of closely planted eucalyptus trees hide and dwarf the low rolling hills beyond. An avenue of eucalyptus trees taken by itself is most impressive and satisfying, with its vista of great trunks and spreading boughs. Taken in connection with the adjoining landscape, and we believe that at least on country roads this is the main point to consider, the effect of the same avenue may be most disastrous.

An avenue of palms stately and beautiful in itself looks out of place in most parts of California. It is making a feeble imitation of the tropics out of a temperate country, often for a purely commercial reason—that is, to please tourists who are even now becoming dissatisfied with this false ideal.

IRREGULAR PLANTING.

Irregular planting of the highway contributes much toward preserving the natural aspect of the country. It helps to prevent the "checkerboard" effect produced by many conventional avenues intersecting each other on a valley floor, when viewed from an adjoining height. Continuous shade is perhaps not so much of a necessity in these days of rapid transit. There are some practical reasons which make a scattered planting very desirable—such as the quicker drying of the road; more easy avoidance of trolley and telephone poles, when the lines must follow the highway, and less injury from shade to some growing crops.

In support of this method of planting we quote from a pamphlet written by G. H. Allen, B. S., and endorsed by the Munson-Whitaker Company, landscape foresters, of New York and Boston. Mr. Allen says, "Along country roads the trees should be planted in an irregular manner, leaving intervals of open. . . . . Along city streets the trees may be arranged in a more conventional manner, although broken rows are by no means desirable."

A SPECIAL PROBLEM.

The following is one of the problems where the irregular planting of native trees seems the only solution—the planting of a highway which on a valley floor crosses and recrosses a wooded stream, at times following it for a short distance. In such a case, if an attempt is made to plant the highway in a formal manner with exotic trees, the treatment becomes confused and absurd. For either the highway must be broken up into sections by the interruption of the stream, or else the graceful fringe of native trees along the bank is ruined by the regular spacing of foreign trees. By scattering the native oaks, sycamores or willows of the creek bank along the rest of the highway, the harmony of the whole is secured. But, could the highway in the first place have followed the stream, along its entire course, the ideal would have been attained.

NEW RESIDENCE TRACTS.

In laying out residence tracts in wooded regions, curved roads are logical and often employed, even in a level district. The trees are thus more easily avoided, and the beauty of the groves preserved. Little or no planting of the new roads is necessary. Unfortunately examples are to be seen of tracts where straight roads have been driven through the groves of oaks or other native trees, and emphasized by the planting of exotics, all in utter disregard of the original landscape.

CONVENTIONAL AVENUES.

Even when the highway or city street is regularly planted, preference should be given to native trees. The native laurel and big-leaved maple are admirably adapted for conventional avenues. And even the willow or sycamore, though losing in picturesqueness, will with care become more suitable for formal planting.

THE GREAT CENTRAL VALLEY.

In the valleys of the Sacramento and San Joaquin the problem of planting becomes more complex and the ideal more difficult to attain. The treeless stretches of this great valley, with the snow-capped Sierra always in sight as the dominant feature of the landscape, have their own charm. But immediate shade is a necessity in that region of great heat; and there remains only for us to plant in such a way as to mar as little as possible the original beauty of the landscape. Where native trees exist, except in the vicinity of water courses, it is the graceful "weeping oak" that more than any other tree gives distinction to the valley floor. To emphasize this dominant tree, the roble of the Spaniards, more strongly, placing it in groups about homes or irregularly along the highways; and to greatly widen the fringe of native growth with ash, alder and cottonwood along the streams, might be the ideal general treatment for the great valley. For quick shade the oaks could be interspersed with native maples, cottonwoods, and other fast-growing trees. At least let us not thoughtlessly interpose a huge unchanging barrier of alien trees between us and "that wall of light, ineffably fine, and as beautiful as a rainbow, yet firm as adamant."

The gray-foliaged Sabine pine lends a peculiar charm to the hot, dry foothills of the Sierra and other ranges. It should be cherished for its decorative value in the regions where it grows; and the various species of oaks (its associates) depended on for shade.

THE OCEAN SHORE.

Cool breezes make shade less of a necessity in a driveway near the sea. And there is the sense of freedom and wildness and broad outlook over the water to make us hesitate before doing any planting there. It would be a pity to thrust petty designs or tropical foliage on our rugged headlands to disturb the characteristic beauty of the sand dunes; or to make of any roadway following the seashore an aggressive line of planting, destroying the subtle beauty of the shore line and ruining the contour of headland and mountain and gently sloping hill.

When planting seems a necessity there, and it must form an integral part of the landscape, the native growth and its arrangement should be carefully studied. Where shade is needed, groups of native conifers might form the setting for dwellings or other buildings as the road approaches bold promontories. It is significant that when the Monterey pine and cypress are transplanted to our dry inland valleys their life is very much shortened.

Where deep, wooded cañons end abruptly near the ocean, the growth of redwood or other native trees might be extended in straggling groups, as though they had strayed from the main forest. And where willows, laurels and alders follow the water courses quite to the sea, additional irregular plantings of these same trees might be made nearby upon the shore.

THE SEMI-DESERT COUNTRY.

The desert, too, has its unique beauty which needs no adornment from the hand of man. He is, in a sense, an interloper, and should strive, at least, not to "make nature hideous by his presence."

In the semi-desert regions of southern California yuccas and palms may be legitimately used for planting. There is one native species of the latter—*Washingtonia filifera*. If the native trees do not give enough shade, where heat and light are so intense, there are exotics which might properly be made use of, such as the mimosa, the carob, and the locust. These being of the same general type as the native mesquite, they would in a measure preserve the harmony and character of the landscape.

The piñons and junipers which give such a unique charm to the mesas and low hills, should by all means be made use of for home and highway planting in the regions where they grow.

NOT A GEOGRAPHIC LINE.

It will be seen that there is no thought of drawing a mere geographic line in advocating the choice of native trees for planting. By native is meant the tree or shrub indigenous to a given locality, not to the State as a whole. A redwood tree, for instance, transported from a deep, moist cañon of the northern ranges to the level, semi-desert country of southern California, would be out of harmony with its new environment. A foreign tree might be much more suitable from a landscape point of view. There is the beauty of the three or shrub viewed alone, and the beauty that comes from the harmonious whole. The olive is one of the foreign trees that seems not out of place in certain parts of the California landscape.

DETAILS—PRACTICAL WORKING—GENERAL SCHEME.

To sum up: Preserve the original landscape as far as possible by the planting of native growth.

When, for practical reasons, the native trees and shrubs can not be used for planting, select from exotics those which are of the same type—that resemble the native in form, texture or color.

In presenting this paper we feel how incomplete and inadequate it is to this important subject. But we believe that at least the principles set forth are fundamentally correct. Each section of this great State must, with patience and feeling, solve the planting problem for itself.

It is hoped that the bill (initiated by this organization) creating in each county a forestry commission and forester, will, in its amended form, be signed by the Governor at the coming session of the legislature. We believe that it will prove a practical system for the protection and proper planting of highway trees.

But it would seem that the general supervision of some central body is needed to secure the harmonious treatment of the State as a whole, with its varied, wonderful and characteristic beauty.

THE SEQUOIA SEMPERVIRENS OR COAST REDWOOD OF CALIFORNIA.

By Mrs. Stephen A. Jones.

Scientists tell us that in the Pliocene Age there were nearly twenty species of Sequoia of world wide distribution. They grew all over northern Europe, and in North America, from the latitude of Nebraska and Dakota to Greenland and Alaska. Some of these closely resembled our two surviving species. A mild climate and rich soil encouraged the growth of these magnificent forests, and beneath their shade flourished many plants and animals now extinct.

Then came that unexplained change of climate known as the Ice Age, and immense glaciers extended slowly down from the north over this fertile region, planing down hills, filling up valleys, and grinding off the peaks and ridges of mountains. When it passed away, as in the slow eons of time all things pass, many forms of life had perished utterly, and failed to reappear.

Of the Sequoia only two species survived, and these were both in California, the *S. gigantea* being restricted to the western slopes of the Sierra Nevada Mountains. and the *S. sempervirens* to the Coast Range, from the bay of Monterey to the Oregon line.

It is of the latter, the redwood proper, that this paper treats. They are magnificent specimens of the tree world, their fluted columns rising into the air a height of from two to three hundred feet and measuring from thirty to sixty feet in circumference a little above the ground. For a third or more of the height, their trunks are clear of branches; then the boughs covered with the evergreen foliage stretch out and mingle with each other, forming a roof of verdure. The fibrous bark is of a cinnamon brown color, several inches thick. The wood is also of a rich brownish red; in quality light but firm. free and straight grained, quite durable and slow to burn. The tree is tenacious of life, the stumps even of the oldest trunks long retaining their vitality at the circumference and sprouting into a circle of fresh young shoots. It was on this account that the name Sempervirens—ever strong—was given to it. Scientists differ as to age of the largest trees, but the most conservative estimates place it at two thousand years.

When the Anglo-Saxon pioneer first penetrated into the Coast Range Mountains he saw around him vast stretches of forest verdure, a wilderness ocean. Along the crests, down the ridges, on all the slopes and in the cañons stood the shaggy growth of centuries.

Redwoods rose in stately ranks, and around them, reaching to their lower branches, grew other coniferous trees, also oaks, madrones, horse chestnut, button-wood and laurel. Lower still were thickets of hazelnut, berry bushes and vines, mansanita, California lilac, wild roses, azalea and honeysuckle. Of ferns there was a great variety, the *Woodwardia* having fronds from eight to ten feet long.

From innumerable springs little rills trickled down to join the streams and swell the creeks, in whose waters could be found an abundance of fish. The forest abounded in game—bear, deer and smaller animals. Into this region settlers came and secured land, taking up timber claims and acquiring a title from the Government. The great commercial value of these forests was apparent, and as soon as wagon roads could be cut, sawmills were erected at convenient places on the water courses. The trees that clothed the ridges near what is now Redwood City were the first to fall, being the most accessible, and the lumber was hauled by teams to build the houses of San Francisco. Year after year new roads were cut, new mills put up, and the destruction of the redwoods went on.

A half century has witnessed the gradual denuding of these mountains, until now only a few sections remain whose original beauty has been untouched by ax or fire. The traveler who passes along the roads sees only here and there a remnant of the primeval forest; but he sees everywhere immense stumps, and often prone columns, stately even in their stripped and scorched condition. In some places a thicket of young growth has sprung up, presenting a surface of green foliage to the eye, but in many sections the traveler sees only a parched and barren expanse, stumps, burned logs, the dry beds of streams and a general aspect of desolation.

The building of railroad lines into the rich forests has facilitated the destruction of trees. The branch of the Southern Pacific Railroad which reaches the town of Boulder Creek in the Santa Cruz Mountains, is said to be the most profitable, according to its length, of any part of that system. Its cars haul away from this region annually millions of feet of lumber in various forms—boards, shingles, stakes, railroad ties, telegraph poles, and cordwood. A thousand men find employment in the vicinity of Boulder Creek, and the bare and dusty hillsides bear mute witness to their industry in the past. As a result, this region, one of the most beautiful formerly, is now one of the most barren and unattractive. Springs have dried up, water courses have shrunk to mere threads or disappeared entirely, and the winter rains, no longer held in check by the porous soil of the forests, rush away in torrents as soon as they cease to fall. Even the climate has changed. The rainfall at Boulder Creek was formerly the heaviest in the State, reaching the large amount of 100 inches annually; it is now 40 inches.

Having thus hastily sketched the history and destruction of the redwoods, I will relate the fortunate preservation of the last surviving remnant of these forest monarchs.

THE RESCUE OF THE REDWOODS.

In the northern part of Santa Cruz County, surrounded by ridges of the Coast Range, lies a vast natural amphitheater, known as the Big Basin. It is a heavily wooded tract of land, varied by hills and valleys and traversed by clear streams, which take their rise from the many springs within its boundaries. These streams, uniting to form creeks, find their way through deep, rugged gorges, and finally empty into the Pacific Ocean, not many miles away. From the seaward or western buttress—a ridge 2,300 feet high—one obtains a magnificent view of the ocean on one side and the unbroken forest of the Big Basin on the other.

The land slopes away steeply on either side of this ridge, and the beholder sees, by only turning his head, the foam-fringed shore of the blue Pacific, ten or fifteen miles away, and the tranquil, dark green depths of the redwoods. On the seaward side he can view some traces of the presence and handiwork of man; a lighthouse here and there on a projecting point, a cleared space in the forest, the roof of a ranch home far away. But on the landward side it is just as nature left it, a solid surface of tree tops down all the slopes and in all the cañons.

The Big Basin is not many miles from Boulder Creek, the center of the lumbering industry of this section, but its natural ramparts have preserved it from violation. It would be slow and costly work to cut wagon roads into it and undertake to mill the standing timber and haul it out by teams; so while waiting for the railroad to tunnel through one of its ridges and build a branch line into it, the millmen contented themselves with denuding the more accessible hillsides in the neighborhood of Boulder Creek. But redwood lumber was rising in value in proportion as it grew scarce, and at last the word went forth that the Big Basin was to be invaded, and the last remnant of virgin forest was to be given over to destruction.

Then the dormant public sentiment was aroused; then the cry sent up, "Save the redwoods!" Letters began to appear in the newspapers; scientists bewailed the impending loss to the world; utilitarians prophesied the drying up of all the streams which had their rise in the Big Basin, and the consequent loss of the water for practical uses; sentimentalists deplored the despoiling of so much beauty; sportsmen remembered the deer covers and the trout pools.

Finally, in May, 1900, a party of eight, consisting of representatives of these various classes, went to the place with a view of exploring it, learning the facts of the case, and seeing what measures, if any, could be taken to rescue the redwoods from total destruction.

When our purpose was announced, every facility was placed at our disposal and every courtesy shown us by the owners of the land. We went to Boulder Creek by rail, and thence by team twelve miles into the Big Basin. We took our own tents and bedding, but provisions were hospitably supplied us, likewise the services of a cook and guide. At the end of the wagon road the team left us, and we pitched our tents on the banks of a clear stream, fringed with elders and azaleas, and shaded by giant redwoods.

From this camp, as headquarters, we made long excursions on foot into the depths of the primeval forest. Without a guide we could not have found our way, for the trails were dim and overgrown, often marked only by obscure blazes on trees. Even old hunters, and others experienced in woodcraft, have been lost in this Basin, for it is one succession of wooded hills and valleys and running streams after another, all so much alike that the traveler gets bewildered.

Indian file, with the guide leading, we made our way through the untrodden forest, crossing streams on boulders or fallen logs, beating our way through thickets of hazelnut and huckleberry bushes, coming out into beautiful park-like openings clear of underbrush, hearing no sounds but the querulous challenge of a bluejay or the chatter of a squirrel. It was truly:

"Primeval forest, virgin sod
That Saxon hath not ravished yet."

All around us the redwoods rose in stately ranks, their evergreen boughs blending far above our heads, so that we seemed to be walking through the aisles of some vast natural cathedral.

As we penetrated into the remote recesses of the forest, wondering what new scene of beauty would be unfolded before us as we climbed a ridge or turned the flank of a hill, we realized the joy of explorers; we understood how, in all ages, the charms of the wilderness have lured men away from civilization, and made them count as mere trifles the attendant hardships.

Some of our party measured trees and estimated their commercial value, with a view to naming a price for the land in the event of a future purchase; the sportsmen fished in the trout streams; the poet heard music in the sighing of the wind amid the lofty tree tops; while our photographer set up his camera and took many views of the forest scenery. This gentleman, Andrew P. Hill of San José, has been identified from the first, heart and soul, with the movement to save the redwoods, and though many enthusiastic workers have lent their aid by tongue and pen, by personal influence and active effort, to the cause, yet when a list of all who have participated is written, his name, like Abou Ben Adam, will lead all the rest.

We wandered in this magnificent forest for several days, meeting no one, hearing no human voice except that of our own party and apparently as remote from civilization as if hundreds of miles intervened between us and the haunts and homes of men. The only signs we saw to prove that we were not the first to tread the wilderness were two deserted cabins, on different sections and far apart, which had been the abode of the original owners of this land when they lived on it in order to take up their claims. These cabins stood open to wind and weather and blackberry vines grew on the hearthstones and over the ballen sticks of the mud-daubed chimneys. Nature was fast reclaiming her own. Ferns, waist high, grew around the doorways and obliterated the paths leading to spring or stream, and only the shy lizard darted across the floor which had once echoed to human footsteps.

One night, sitting around our camp fire, with the murmer of the stream in our ears, and the stars visible through the interlacing redwood boughs above us, we talked of the best way to begin in the matter of trying to preserve this forest, to preserve it not only for ourselves and our friends, but for the State, for the world for future ages.

We then and there formed the Sempervirens Club, and pledged ourselves to work for the purchase of this forest as a state park.* It was deemed unwise to ask the General Government to buy it for a reservation, as there was already a bill before congress asking for an appropriation for the purchase of the Big Tree Grove in Calaveras County, so we decided to solicit State aid in the matter.

We came out of the Big Basin full of enthusiasm for our project, and for the next few months we talked of little else. The movement met with warm approval from some people, with outright opposition from others, while many regarded it with apathetic indifference.

Newspapers rallied to our standard, university professors and teachers generally were in sympathy; so were such organizations as the Pioneers' Society, the Native Sons and Native Daughters, etc. We had gained an option of the land most heavily wooded, and the owners promised that no sawmills should be erected or cutting done until the legislature, to meet the following winter, had been asked for an appropriation. In the months that intervened a campaign of education was carried on. Circulars setting forth the project and illustrated by cuts reproduced from photographs taken by Mr. Hill in the Basin were scattered broadcast over the State; innumerable newspaper articles were written; public meetings were held; civic bodies and fraternal organizations passed resolutions. On the other hand, the movement was scoffed at as the project of dreamers and enthusiasts; hard-headed business men said it would not succeed; politicians called it a scheme to rob the State for the benefit of the owners of the Big Basin.

People meeting us on the street stopped to say in the soothing tone one would use to a mentally unbalanced fanatic: This idea of yours is a fine one, but it is impractical; the State will never appropriate so much money for an obscure tract of land away off in the Santa Cruz Mountains. But as Tennyson says in his poem, "The Defense of Lucknow," after stating with cumulative force all the hardships and horrors of that siege—

> "Ever upon the highest roof, the banner of England blew."

So in the face of a thousand difficulties and discouragements the friends of this movement pressed on; so, figuratively speaking, above the din and conflict waved the banner of the Sempervirens Club. Finally, the legislature met, the bill was introduced; then came the tug of war. Friends lobbied for it, enemies opposed it, politicians wrangled over it; leading newspapers of the State took sides for and against it. Space forbids the giving of particulars. Suffice it to say that the fight was a hard one. But finally it became apparent that public sentiment was in favor of it. The bill passed the house and was brought into the senate, had a narrow escape from being snowed under, was rescued and read out of its turn, and passed in the closing days of the session. The next question was, would the Governor sign it or give it a pocket veto? Strong pressure was brought to bear on him to prevent his signing it. These were anxious days for the friends of the movement. They made their first rally, and the consequence was that a flight of telegrams from all over the State reached the Governor's office and lay on his desk and floor as "thick as autumn leaves in the vale of Vallombrosa."

He was convinced that the people wanted, with genuine and strong desire, to save for themselves and posterity that heritage of the ages, that forest of redwoods. He signed the bill, and a shout of triumph went up from all who had worked for the cause. In accordance with the provisions of the bill he named a board of five commissioners, of which he was a member by virtue of his office, to negotiate the purchase of the desired tract. Some delay ensued, as surveys had to be made, boundaries determined upon, titles looked up and other tedious details settled, but a tract of thirty-eight hundred (3800) acres, including the most heavily wooded land in the Big Basin, has now been formally acquired by the State, and is called the State Redwood Park.

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* May 18, 1900.

The original Sempervirens Club, instead of dissolving, as a body whose work is finished, has just been reorganized, with a larger membership than ever. In the future it will work for the acquisition of adjoining territory, for the enlarging and beautifying of the tract thus rescued from destruction.

As a recent result of its efforts, and through the influence of our representatives at Washington, several tracts of adjacent land belonging to the National Government, amounting in all to three thousand one hundred and sixty (3,160) acres, have been given to the park.

That the public appreciates this playground and breathing space provided for them in the midst of inspiring surroundings, is attested by the fact that many hundreds visit it every summer. For their convenience a more direct route of access is desirable, and it is hoped that a new and shorter road into it from Santa Clara Valley may soon be opened.

Also, a scenic boulevard, within the boundaries of the Park, which would permit travel by carriage and automobile, where now there are only narrow foot-trails.

The late Father Kenna, formerly of Santa Clara College, who was identified with the movement to save the Big Basin redwoods and who served on the Commission in an official capacity, was especially active in the matter of building highways to render the Park more accessible. He exerted his influence by tongue and pen, to this end, and one of the last acts of his noble, unselfish life was to collect money to pay for a survey for a scenic driveway around and through the Park. When this project is finally realized, and a name for the new road is chosen, what more appropriate and fitting than to call it the Kenna boulevard?

In conclusion, the writer of this article would like to say that as a charter member of the Sempervirens Club, and one who rejoices in its achievements, she does not wish to claim all the glory of victory for the club. To be sure, we were on the fighting line and our battle cry, "Save the Redwoods," sounded above the din of conflict; but we also heard the shouts of unseen allies, and felt behind us the support of a statewide public sentiment.

It was the reënforcement from invisible spiritual sources, the encouragement and support from scores and hundreds outside the actual membership of the club, which finally enabled our little band of fighters to win the victory. To them much of the credit of the result is due; certainly without their assistance it never could have been achieved.

CHAPTER IX.

SUGGESTIONS TO THE PROSPECTIVE FOREST STUDENT.

In response to the many inquiries received by the department, relative to the opportunities presented by Forestry, and the kind of preparation necessary to fit oneself for this profession, the following information has been prepared. And questions which are not covered here will always be promptly and willingly answered by this department.

Forestry is still a new, and yet clearly established profession, and it presents almost unlimited possibilities to the technically trained man. But there is no profession in existence which demands a more thorough preparation. The first demands for foresters were met with an inadequate supply and it was possible for all to secure employment. Although the profession cannot yet be called crowded, it has reached that stage where the employer, whether it be the Government, State, or private owner, demands high credentials and thorough training of the applicant.

Many young men are attracted to the profession of forestry because of the glamour of the outdoor life, and the rather wide travel which often goes with the work. Being a new profession it is often painted in romantic colors, and no mention is made of the hardships and privations, which must be endured by every forester. Some of these men will be quickly weeded out, but there are many who derive great pleasure and opportunity for development from such work.

The prospective forester may best begin his preparation by a full course in some college where he can gain a knowledge of the basic subjects of forestry. He should include in this course the studies of geology, botany, chemistry, mineralogy, and mathematics, including a practical understanding of the principles of surveying. Graduation at such a college should be followed by a course at some school of instruction in professional forestry.

As far as possible, the vacations should be spent in the woods, acquiring a practical knowledge of forest methods. It is essential that every forester should have a thorough knowledge of lumbering methods, for lumbering is more closely allied to forestry than any other profession. The student may elect to get his practical training by working for the Government service, the State service, or for a private lumber concern.

The only position in the Government service, open to those whose training in forestry is incomplete, is that of field assistant. This is merely a temporary position and was created solely for the purpose of familiarizing young men who are thinking of following forestry in the field and office methods of the Government service. The work is severe and monotonous and no one should accept a position as field assistant unless he is bodily sound and willing to work. The work consists mostly in "valuation surveys" or the measurement of the standing timber on given acres and in "stem analysis" or measurements of the contents and rate of growth upon felled trees. The pay is $50 per month and living expenses, but the student is required to pay his own traveling expenses from his home to the field.

Several of the states employ temporary help during the field season. The work varies considerably in the different states. Where there is a state forest reserve the work is greatly similar to that of the Government, but in the states where there is no state revenue, the work consists mainly of technical investigations throughout the state, under the direction of the forester. The pay differs, depending upon the state and the kind of work, but it is generally about the same as that of the field assistant in the Government Forest Service.

The best way to gain a practical knowledge of lumbering methods is by working for a private lumber concern, and the prospective forester who can spend at least one vacation in working in a logging camp or sawmill, will be able to gain a much broader knowledge of the practical application of forestry. Forestry is largely a matter of the economic use of forests—in other words, of forest operations, and to thoroughly understand utilization, life in close touch with lumbering operations is a necessity. The combination of practical woodcraft and theoretical forestry should be the aim of all students of the subject.

Where the prospective forester is unable to follow up some course similar to the one prescribed, it becomes a question as to what may best be omitted. If one cannot spend the time necessary to complete both the college course and the graduate course at a professional school, the best method is to select some good under-graduate school of forestry. There are several colleges in this country where a very good training in forestry is given. In fact, it is still open to question whether many of these colleges do not offer as satisfactory a course of training as the graduate schools. It is essential, however, that as much time as possible be spent in the woods gaining practical experience in forest methods.

It must be remembered, that in forestry, as in any other scientific profession, only the man who has had a thorough and systematic training can hope to succeed. Other conditions being equal, it is the man with the best training who is always selected for advancement.

No profession offers greater opportunities for individual success through public service than does forestry. Private forestry presents a comparatively new field, for it is only of recent years that the private and corporate owners have paid any attention to the problem of the preservation of their forests and future cuttings. But it is likely, that as forestry becomes recognized, and its practice financially justifiable, private work will offer a more attractive field and greater opportunities than public. Whatever the field, success in the work can only be won by conscientious effort, and involves not only a thorough technical training, but also a practical insight into actual forest conditions.

For those who do not desire to practice forestry or lumbering, there are many opportunities for investments in timber lands which will yield a good revenue, and to one who has not the capital necessary to become an investor, the opportunities offered in the timber brokerage business are unexcelled.

As regards compensation, forestry offers a fair living to the trained man. The trained forester, upon entering the Government service, is given the position of forest assistant. This position carries a salary of $1,100 to $1,200 a year in the beginning, with the payment of all living and traveling expenses incident to field work. The highest salary paid in the Government service is $5,000 a year, which is the salary of the forester. In State work, the salaries vary with the states, but the average is no higher than that received in Government work. It is impossible to estimate the salaries paid in private practice for each concern has its own standard.

Forest Schools In the United States.

The general interest in forestry has grown with marked rapidity in the last two decades. The Federal Government has created National Forests, and several states have established reserves or parks. Many private owners realize the practicability of employing foresters to care for their properties, and an improvement in the smaller holdings is already noticeable.

The early education of the people at large and of their governments on the subject of forestry, was carried on by the United States Division of Forestry and especially by forestry associations which were organized in all parts of country.

Some provision for technical education was made long before opportunity for its application had arisen, and before any professional foresters were in existence to do the teaching. Educational institutions were attracted by the new doctrine, and the desire to assist in the popular movement, led to the introduction of forestry, at least by name, into their curricula. Professors in botany and horticulture, in addition to their regular work would explain as far as they knew, the methods of forestry, or at least give lectures on dendrology and forest geography. By 1897, twenty land grant colleges had in this way introduced the subject.

Dr. Bernhard E. Fernow, LL.D., organized the first professional forest school when, in 1898, he founded the New York State College of Forestry at Cornell University. Dr. Schenck almost simultaneously opened a private school at Biltmore, North Carolina, and thus the era of forest schools was inaugurated.

A year later, Mr. Pinchot endowed another forest school at Yale University. This was followed, in 1902, by the University of Michigan adding a department of forestry, and then followed a real realm of educational enthusiasm, one institution after another adding the subject to its courses.

Today, forestry is taught in three technical or special schools in the United States and elementary courses on the subject are given in several colleges and preparatory schools. A point has been reached where it deserves attention and a desire has been expressed to introduce this nationally important and interesting study in the public schools.

Dr. Schenck states that the tendency in the United States as well as in Germany, with reference to the forest schools, is a tendency of decentralization. This is unfortunate, as small schools do not develop specialists and to further the policy of forestry, specialists are required.

There are now more than twenty different colleges and universities giving complete graduate or under-graduate courses leading to professional degrees in forestry. and several others giving some instruction in the general principles of forestry or in certain branches of it. The principles of forestry are also taught in an elementary way in numerous secondary schools, and one state has a school to fit rangers for its own forest work. This indicates a great advance in forest education and an urgent demand for it. Therefore, a young man wishing to enter forestry work, can find ample opportunity for preparation.

Following is a list of institutions giving instruction in forestry in the United States:*

Post-Graduate.

1. Yale University. Forest School, New Haven, Connecticut.
2. University of Michigan, Forest School, Ann Arbor, Michigan.
3. Harvard University, Forest School, Cambridge, Massachusetts.

The forest schools at Yale and Michigan give a two-year post-graduate course and the degree of Master of Forestry. In addition, Yale has a two months' summer course at Milford, Pike County, Pennsylvania; and Michigan, a six weeks' summer school at Roscommon.

Harvard has a two-year graduate course.

Under-graduate.

The following schools give a four-year course leading to a degree in Forestry:

1. Colorado School of Forestry, Colorado Springs, Colorado. (Also a summer course.)
2. Harvard University, Forest School, Cambridge, Massachusetts. (In Lawrence Scientific School.)
3. Cornell University, Ithaca, New York. (New York State College of Agriculture.)
4. University of Washington, School of Forestry, Seattle, Washington. (Also three months' winter course for forest rangers.)

The following give a three years' course:

1. Berkshire Forest School, Mount Washington, Massachusetts.
2. Pennsylvania State Forest Academy, Mont Alto, Pennsylvania. (Practical work in summer months on Mont Alto Reservation.)

The following schools give short terms or special courses in forestry. Such as devoting certain periods in some term of an agricultural course, giving lectures, two months' summer course in forestry, farm forestry, etc.:

1. Idyllwild School of Forestry, Riverside County, California.
2. Stanford University, Palo Alto, California.
3. University of Chicago, Chicago, Illinois.
4. Winona College of Agriculture, Winona Lake, Indiana.
5. Berea College, Berea, Kentucky.
6. Eric Forest School, Duxbury, Massachusetts.
7. Mount Hermon Boys' School, Mount Hermon, Massachusetts.
8. Smith's Agricultural School and Northampton School of Technology. Northampton, Massachusetts.
9. Crookston School of Agriculture, Crookston, Massachusetts.
10. University of Montana, Missoula, Mont. (Courses in botany and forestry leading to a degree, and short courses in forestry in January, February and March.)
11. Hobart College. Geneva, New York.
12. University of Syracuse, Syracuse, New York. (Technical forestry in junior and senior years. Professional forestry degree after one year spent in graduate study and field work.)
13. Biltmore Forest School, Biltmore. North Carolina. (Course covers one full year leading to degree of Bachelor of Forestry, and, with two years of practical work, the degree of Forest Engineer. It is now a traveling school, having working fields during twelve months of each year.)
14. State Forest School. Bottineau, North Dakota.
15. Antioch College, Yellow Springs, Ohio.
16. Murray State School of Agriculture, Tishomingo, Oklahoma.

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*"American Forestry," September, 1911, issue.

17. Middlebury College, Middlebury, Vermont. (Two years' course in forestry.)

18. Marathon County School of Agriculture and Domestic Economy, Wausau, Wisconsin.

19. Wyman's School of the Woods, Munising, Michigan. (Two years practical course.)

Land grant colleges.

Those giving a four years' course leading to a degree in forestry, are:

1. State Agricultural College, Fort Collins, Colorado.
2. Georgia State College of Agriculture, University of Georgia, Athens, Georgia.
3. University of Idaho, Moscow, Idaho.
4. Iowa State College of Agriculture and Mechanical Arts, Ames, Iowa. (Horticulture and Forestry.)
5. Kansas State Agricultural College, Manhattan, Kansas. (Also post-graduate work.)
6. University of Maine, Orono, Maine. (Also post-graduate work in forestry, leading to a degree of M.S. and a correspondence course in forestry.)
7. Michigan State Agricultural College, East Lansing, Michigan. (Also a five-year course open to graduates of the eighth grade. Graduate work with M.S. degree.)
8. College of Forestry, University of Minnesota, St. Paul, Minnesota. (Offer a four weeks' winter course, including forestry, also graduate work.)
9. Montana Agricultural College, Bozeman, Montana. (Forestry also included in the three-year horticultural course.)
10. University of Nebraska, College of Agriculture, Lincoln, Nebraska. (Instruction in forestry is also included in the one year teachers' course in agriculture for high and normal school teachers.)
11. College of Agriculture and Domestic Science of the Ohio State University, Columbus, Ohio. (Forestry also offered in the first term of the second year of the two-year course in horticulture.)
12. Oregon State Agricultural College, Corvallis, Oregon. (Two-year elementary course in forestry and a six weeks' winter course for forest rangers.)
13. Pennsylvania State College, State College, Pennsylvania. (Forestry, also an elective in the two years' agricultural course.)

Those institutions who devote merely a "period" or year to forestry in connection with their other courses, etc., are:

1. Alabama Polytechnic Institute, Auburn, Alabama.
2. Agricultural and Mechanical College for Negroes, Normal, Alabama.
3. University of Arkansas, Fayetteville, Arkansas.
4. University of California, Berkeley, California. (Course of ten lectures by members of the Forest Service during the summer session.)
5. Connecticut Agricultural College, Storrs, Connecticut.
6. Delaware College, Newark, Delaware.
7. University of Illinois, Illinois.
8. Purdue University, Lafayette, Indiana.
9. Maryland Agricultural College, College Park, Maryland. (Besides the weekly lectures in forestry, farm forestry is taught in the two-year agricultural course.)
10. Massachusetts Agricultural College, Amherst, Massachusetts. (Lectures given annually by State Forester.)
11. Mississippi Agricultural and Mechanical College, Agricultural College, Mississippi.
12. College of Agriculture, University of Missouri, Columbia, Missouri.
13. University of Nevada, Reno, Nevada. (Forestry taught as an elective in the four years' agricultural course.)
14. New Hampshire College of Agriculture and Mechanical Arts, Durham, New Hampshire. (Junior and senior years of agricultural course and in both years of the two years' course.)
15. North Carolina Agricultural and Mechanical College, West Raleigh, North Carolina. (Senior elective, first term, agricultural course.)
16. State Agricultural and Mechanical College for the Colored Race, Greensboro, North Carolina.
17. North Dakota Agricultural College, Agricultural College, North Dakota. (Six weeks' course in forestry in the junior year of agricultural course.)
18. Oklahoma Agricultural and Mechanical College, Stillwater, Oklahoma.
19. Rhode Island College of Agriculture and Mechanical Arts, Kingston, Rhode Island.

20. Clemson Agricultural College of South Carolina, Clemson College, South Carolina.

21. South Dakota Agricultural College, Brookings, South Dakota.

22. University of Tennessee, Knoxville, Tennessee.

23. Agricultural and Mechanical College of Texas, College Station, Texas.

24. Agricultural College of Utah, Logan, Utah. (The U. S. Forest Service and the Utah College offer jointly a three months' winter course for forest rangers.)

25. Virginia Agricultural and Mechanical College and Polytechnic Institute, Blacksburg, Virginia.

26. Hampton Normal and Agricultural Institute, Hampton, Virginia.

27. State College of Washington, Pullman, Washington. (Besides teaching a semester in the horticultural course, there is a school of forestry with a two-year course.)

28. West Virginia University, Morgantown, West Virginia.

29. University of Wisconsin, Madison, Wisconsin.

CHAPTER X.

APPROPRIATIONS AND EXPENDITURES.

The sixty-third and sixty-fourth fiscal years date from July 1, 1911, to July 1, 1913. The appropriations for the above mentioned fiscal years were as follows:

Salary of State Forester	$6,000 00
Salary of Deputy State Forester	3,600 00
Salary of Assistant State Forester	3,200 00
For support of State Board of Forestry, including field and traveling expenses	15,000 00
For printing, binding, stationery, etc.	2,500 00
Total	$30,300 00

The expenditures under this appropriation were as follows:

Salary of State Forester (to November 1, 1912)	$4,000 00
Salary of Deputy State Forester [1](to November 1, 1912)	2,045 00
Salary of Assistant State Forester [2](to November 1, 1912)	1,867 03
Total	$7,912 03
Balance November 1, 1912	$4,887 97

Appropriation for support of State Board of Forestry		$15,000 00
Equipment, supplies and miscellaneous	$870 39	
Fire investigations	845 67	
Educational work (attendance at forestry meetings, lectures delivered, etc.)	974 47	
Forest studies:		
Taxation of timber lands	1,019 10	
Ownership of timber lands	2,038 21	
Cut-over lands	1,691 86	
Street and highway planting	375 77	
Postage	418 00	
Telephone, telegraph and expressage	225 53	
Stenography, typewriting and clerical help	1,911 45	
Janitor	225 00	
Total		10,595 45
Balance November 1, 1912		$4,404 55
Appropriations for printing, binding stationery, etc.		$2,500 00
Fire warnings and notices	$227 37	
Stationery	272 21	
Binding	7 78	
Fire reports, bulletins, forms, etc.	1,247 49	
Total		1,754 85
Balance November 1, 1912		$745 15

The unexpected balance is extremely limited in view of the amount of work in hand. The field investigations could not be conducted as extensively as it was our desire to do, but a good showing has been made nevertheless for the amount expended and the balance of $4,404.55 is in itself so limited that but little new work can be undertaken until the next appropriation.

The foregoing summary explains why the very limited appropriation of $17,500 is entirely disproportionate to the value of the work to the State. The present lack of adequate funds is a problem that burdens the State Forester continually. It is a most undesirable handicap since the progress of the department is hindered in consequence.

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[1] [2] A temporary vacancy existed in the office of both the Deputy and Assistant State Forester during the sixty-third fiscal year.

We have tried to show, by the following estimate, just what is needed for the sixty-fifth and sixty-sixth fiscal years. In order to successfully carry on the work the law contemplates this department shall do, it will be necessary to provide adequate funds. The estimates have been carefully prepared and are designed to show just what is needed.

The present forest laws contemplate that the Department of Forestry shall prevent and suppress forest fires; ascertain the amount and value of forest resources; collect and publish data looking toward a more economic and rational use of forest products; and coöperate with municipalities and individuals in matters pertaining to forest fires, planting and management. The appropriation made, however, is inadequate to carry on much of the work.

The importance of putting into operation a far-sighted forestry policy cannot be over-estimated. It should be borne in mind that the amount asked for in this estimate is an initial rather than an increased appropriation. An appropriation to actually carry on the work of the Forestry Department has never been made.

It is essential that experienced men, who are also trained foresters, be employed. Such men cannot be secured for the salaries now being paid, or if secured, remain only a short length of time. As a result, changes are constantly being made. I urgently recommend an increase of salary, especially for the deputy and assistant, as follows: State Forester, from $3,000 to $3,600 per annum; Deputy State Forester, from $1,800 to $2,400 per annum; Assistant State Forester, from $1,600 to $1,800 per annum.

A biennial appropriation of $15,000 has been made to carry on the work of the department. This includes all field and traveling expenses and general support of the board. It is the entire working capital. The expenses for traveling, temporary assistants, clerical help, equipment, expenses for running the office, books, photographs, fire investigations, and many miscellaneous expenditures, must all be paid from it.

That needed investigations may be undertaken, and the expenses for an entomologist and two forest inspectors may be met, an increase of $10,000 is recommended.

The present appropriation for printing and binding is $2,500. This limited amount must cover the cost of stationery, binding, fire warning notices, fire report and prosecution forms, burning permits, forest laws and publications. Bulletins, circulars, and published results of investigations cost money. The present allotment is insufficient for stationery and fire material alone; and because the work of this department is educational as well as administrative, an increase of $5,000 is earnestly recommended.

No appropriation has been made for the prevention and suppression of forest fires. There are 381.4 billion feet, board measure, of timber in the State of California, of which 248.1 billion feet is privately owned. It has a stumpage value of no less than $762,000,000, and the privately owned timber has a stumpage value exceeding $496,000,000. For every 1,000 feet, board measure, of timber burned the community looses $10 in wages. Reproduction on cut-over land must be protected from fire; and money, expended for fire protection, is nothing more than insurance. There are approximately 10,000,000 acres of timber and brush covered land not protected by the government. State control being essential, the State should be divided into thirty districts with a paid fire patrolman in charge of each. They should receive a salary of $75 per month and expenses, which will amount to about $100 per month for each man. Tools, equipment, transportation, subsistence and pay for temporary fire fighters will require an additional amount of $80,000. Since a perpetual supply of timber is an absolute requisite for the prosperity of the State, a total biennial appropriation of $132,500 (or two-third cent per acre per annum) is necessary to protect the forest wealth of California. This is a conservative estimate and is based on a fire season of five months.

Two forest inspectors at $1,500 per annum (total $6,000) will be needed to assist in establishing fire districts, outlining patrol routes, locating sites for lookout stations, supervision of telephone construction, preparing district maps, assisting in prosecutions, making fire investigations and studying effects of fire; reporting on dangerous slashing and railroad rights of way; inspecting donkey engines, traction engines, sawmill smoke stacks and locomotive smoke stacks. Their work will also call them among timber owners for the purpose of organizing protective associations; with stockmen and summer resort proprietors for purposes of forming similar associations and with county officials for the purpose of county coöperation. The work will be conducted with this end in view; that the cost to the State will, eventually, be greatly reduced.

Problems, peculiar to forestry, which are as important to the forester in comparison as the problems which confront the physician, chemist or astronomer and which can only be solved in a laboratory (the importance of which no one questions), must be solved by systematic experiments and for this an experimental station is necessary. It is important to know what species are best adapted for different purposes, in localities having a wide variance in soil, moisture and climatic conditions. How long a time will be required for trees to reach marketable dimensions; fertility of the seed, and many other practical problems can be solved only at a properly conducted experimental station.

About one hundred and sixty (160) acres of cut-over land should be secured, that practical methods of reforestation can be worked out. Land, suitable for such a purpose could be secured for $1,500. Construction of buildings, lath house, etc., will cost $3,000, and maintenance and up-keep $3,000, annually. An experimental station director at $1,200 per annum will be needed. Seedlings could then be supplied at cost, upon application, to facilitate the reforestation of watersheds and cut-over lands.

An unestimated amount of timber is destroyed annually by forest insects. That the amount of damage to standing and felled timber may be accurately determined and practical methods of control devised, it is urged that this work be added to and undertaken by this department. It cannot be satisfactorily handled by any other branch of the State service. There is an unlimited field for original investigations without duplication of work. The forest crop deserves attention as well as agricultural crops. An entomologist at $1,600 per annum is recommended.

Summary of Estimates.

Appropriation made in 1911.	Amount.	Increase recommended.	Total recommendation for 1913.
Salary of State Forester	$6,000	$1,200	$7,200
Salary of Deputy State Forester	3,600	1,200	4,800
Salary of Assistant State Forester	3,200	400	3,600
Support State Board of Forestry	15,000	10,000	25,000
Printing and binding	2,500	5,000	7,500
Totals	$30,300	$17,800	$48,100 30,300
Total increase			$17,800

New Appropriation Recommended.

Designation.		Amount.
Prevention and suppression of forest fires		$132,500
30 district firewardens, 5 months at $75 per month	$22,500	
Traveling expenses of wardens at $100 per month	30,000	
Equipment and fire fighting	80,000	
	$132,500	
Forest experimental station		4,500
Purchase of site, 160 acres	$1,500	
Construction	3,000	
	$4,500	
Salary experimental station director		2,400
Support of experimental station		6,000
Salary 2 forest inspectors at $1,500 per annum		6,000
Salary forest entomologist		3,200
Total		$154,600

NOTE.—The complete report could not be published because of the lack of funds. The portions omitted pertain to forest fire, ownership of timber lands, forest taxation, forest laws, and studies completed since the last report.

The completed studies are available for distribution in bulletin form. They are "Wood-using Industries of California," and "Pharmacal Plants and Their Culture."

CALIFORNIA
STATE BOARD OF FORESTRY

ANNUAL FIRE REPORT

1913

ERRATA.

On page 40 the answer to the third question should be:. A. There are nineteen national forests in California, representing 20,555,680 acres of government land.

MR·CITIZEN · MR·OFFICIAL · MR·TIMBERMAN
WILL YOUR CHILDREN HAVE TIMBER TO BURN?
CALIFORNIA
STATE·BOARD·OF·FORESTRY

CALIFORNIA
STATE PRINTING OFFICE
1914

STATE BOARD OF FORESTRY.

HIRAM W. JOHNSON	Governor
FRANK C. JORDAN	Secretary of State
U. S. WEBB	Attorney General
G. MORRIS HOMANS	State Forester

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The forests and streams make for the health and happiness of the State and the Nation. A permanent timber supply is essential. It is far better to protect our forests than to endeavor to regain them after they are destroyed; but—

until the people of California appreciate fully the necessity of providing legislative and financial support for forest protection, forest fires will continue to destroy human beings, live stock, game, timber, young trees, homes, fences, and pasture; and diminish the water supply for municipal and domestic use; for irrigation, water power, and the generation of electricity.

ANNUAL FIRE REPORT, 1913.

INTRODUCTION.

Where does California stand in the practice of forest protection? Why is it necessary for California to protect her forests? Where does California stand in relation to other states in regard to forest protection?

These and many other questions are answered in this publication.

The aim in preparing the report has been to allow none but authentic figures to appear. That the most skeptical may be convinced, facts rather than generalities have been emphasized. Figures concerning which doubt might arise have been eliminated so far as possible. The State Forester depends, for his fire data, upon the Federal Forest officials, and the voluntary firewardens who report fires outside the national forests. Care is exercised to prevent duplicate reports being taken, and, in compiling the tables, duplicates, when discovered have been destroyed. The voluntary firewardens receive no compensation, and some fail to report fires altogether. Consequently, it is impossible, under the present system, to obtain reports of all fires outside the forest reserves.

During the summer repeated calls were made upon the State Forester for assistance in bringing fires under control. Response was made to such calls in as many cases as possible. A representative of the State has been on a majority of the large fires of the season, and the expenses thus incurred paid from the general maintenance fund, an appropriation designated to meet other needful expenditures. Consequently, what has been done in lending assistance in fighting fires was accomplished at the expense of other departments of the work.

The educational phase of the work is important; lectures on forestry subjects are given from time to time before schools and clubs throughout the State. Special attention is given to localities in which the people are ready and willing to organize protective associations for mutual benefit. The State Forester stands ready to give suggestions and other assistance to any community desirous of organizing such an association. Again, feeling the limitation, however, of inadequate appropriation, this cooperation can not be as efficient as it should be. There is undoubtedly much to be done by California in protecting her forests and streams, and, since its realization depends primarily upon unselfish, far-sighted and popular legislation, the subject of forest legislation has been carefully outlined and opposition to such measures frankly and amicably analyzed. The work being done along forestry lines by the Federal Government and by other states is briefly discussed as an index to the comparative neglect which the important phase of development has received in California.

As of general interest and information a few of the average fires have been described, while others of equal interest and importance are too numerous to mention. Many investigations have been made to determine the actual damage sustained, and such investigations are too manifold to publish; however, the information is in the office files and remains as open reference to all who care to secure it.

Appreciation is hereby expressed for the assistance rendered by the United States Forest Service in supplying fire data relative to the forest reserves within the State and also for the generous manner in which reports have been given concerning the work of the various protective associations.

FOREST PROTECTION AS A PUBLIC INTEREST.

Although the citizens of California recognize the magnitude of their forest wealth and its bearing upon the industrial activity in every community, there has been an evident unwillingness on the part of many to realize the importance of adequately protecting our forest areas from fire. California ranks third in her timber supply. There are within the State vast areas of valley and hill land directly dependent upon an already limited water supply. Thousands of acres of brush and timber land throughout the State serve as indispensable regulators of stream flow, and each year our watersheds suffer serious damage from the ravages of fire. This destruction will continue until measures are adopted to prevent it. We, as citizens of California, must face the fire problem squarely and admit as positive the following facts:

1. That forest fires do occasion a very great annual loss in dollars and cents.
2. That all of our industries depend directly or indirectly upon the forests and streams.
3. That we can not afford to permit the annual loss to continue.
4. That we have not given this great problem a fair degree of attention.
5. That there are measures and means of preventing the frequent occurrence of forest fires.
6. That what is lost in one year is sufficient to establish and maintain a protective force for several years.
7. That we should make generous legislative provision for the adoption of measures and means of protection.
8. That sooner or later we, like other countries, will be forced to protect our forests and that the longer we wait the greater will be the cost of protection.
9. That forest protection is a function of the State.
10. That we have a long dry season during which fires readily start.
11. That fires will not put themselves out.

Whatever agencies affect the value of land and other public commodities are of public interest. The supply of water and timber unquestionably bears a vital relation to the value of land and the development of industry and commerce; and, since forest fires annually decrease the supply of timber and water, it is reasonable to associate public interest directly with any adequate system of forest protection.

The importance of our forests lies chiefly in the numerous uses to which they are put. They not only produce lumber, but they hold the soil and conserve the streams. They abate winds and give protection from excessive heat and cold. The forests make for the fiber, health and happiness of the citizens and the State. As a whole, the forests are of importance in providing food and shelter for certain of our domestic animals; in protecting agricultural land in their vicinity; in harboring game; in preventing erosion and fixing drifting sands; in beautifying the landscape in general; and in furnishing healthy employment to many. In hilly country the prevention of erosion is, undoubtedly, of great importance. The water from heavy rain checked in its descent by meeting first with the foliage of the trees, is better retained in forest soil than on bare land. Under a close cover of trees there collects a humus soil formed from the decay of fallen leaves. Through this soil-covering the rain water filters slowly, and its passage is further retarded by the stems and roots of the trees.

There is a gradual change in public sentiment as indicated by attempts made to secure forest legislation in the State. With a forest wealth far greater than that in many other states California still fails to occupy the place she should in forestry. Many states, one or two with a greater wealth of timber than our own, are realizing and expressing this realization through generous forest legislation, that their forest resources are the life of industry in that their conservative management results in money circulation; stimulates labor, and by so doing establishes prosperity. Acting upon this realization the states are developing effective protective policies to prevent the indiscriminate exploitation of their forests.

We cannot extensively accomplish forest protection until the lumbermen become thoroughly awakened to the practical necessity of the work. Unfortunately, some of the lumbermen are mistrustful of any agency directed toward forest regulation fearing, it would seem, that unfavorable and impracticable restrictions will be subsequent. And the general public is .influenced by this attitude on the part of the lumbermen. However, disregarding attitude and unwelcome cooperation, the fact remains that our forests are being seriously impoverished each year. What the State must accomplish is to so educate the suspecting lumbermen and doubting public that wholesome regulations and restrictions will be voluntarily imposed. A law is unjust if it fails to apply favorably for the greater number. Since this is an economic fact it is obvious that the greater number should have the right to make the laws. And if there is law-making to be done it is evident that, in order to have a good law, the people must know its substance and its full significance before permitting it to become law.

The past years have proved that prevention of forest fires is far more effective than merely fighting them after they get beyond control. The Federal Forest Service in recognition of this fact has spent both time and money in establishing thousands of miles of telephone lines in constructing hundreds of miles of trails and roads throughout the National Forests. The well organized system of patrols, undoubtedly, is responsible for the prevention of many fires. This degree of protection is still inadequate to eliminate the fire hazard. Moreover, in California only the territory within the national forests is affected by it; and not until the three agencies, Federal, State and private, cooperate in an endeavor to develop a stronger protective policy will the benefits be generally enjoyed.

Areas in Need of Protection.

Throughout California there are large areas in need of some degree of fire protection. The desert areas are perhaps the only exception to this need. A brief classification of the areas in need of protection enables us to more accurately weigh the fire hazard in different local-

Typical yellow pine forest. Absence of medium sized trees is due to repeated fires in the past. Partial protection in recent years has resulted in securing scattered reproduction.

Sugar pine, one of our most valuable timber trees. Many industries are dependent upon a sustained yield of sugar pine lumber. These trees are being marketed faster than the younger ones mature. The future supply depends upon keeping fire from the cut-over lands, that the small trees may approach the size of the one shown above.

ities. Undoubtedly, some regions are far more in need of protection than others by virtue of the character of vegetation peculiar to them.

Pine lands—1. Timbered. 2. Cut-over.
Redwood lands—1. Timbered. 2. Cut-over.
Chaparral—1. To be protected because of its value as a watershed cover.
2. To be protected because of its nearness to and effect upon agricultural pursuits.
Range—1. Hill. 2. Valley.

Fires raging through pine lands and redwood lands are truly "forest fires." Fires in chaparral are generally termed "brush fires." Quite frequently the term "forest fire" is applied to the uncontrolled burning of chaparral. The term may well be applied although we should not fail to make a distinction when compiling figures to show the damage done in each type. This distinction has been made and the tables showing cost, acreage and damage keep separate the figures for timber land, brush land and range.

Pine Lands.

There have been repeated fires in the past which have devastated our pine forests. These fires occur less frequently, now due to the improved methods of protection adopted by the Federal Forest Service. However, this protection is practiced only on the National Forests.

It is true that the viewpoint of the State with regard to forest protection varies somewhat from the viewpoint of the private timber landowner. The latter wants protection to standing timber and quite generally may not be interested in protection as an investment after the logs are taken out. Right here is where the State looks to protection as an essential feature of management. Excessive cuttings result in an increase of chaparral and inferior species. Very often conditions after logging are most dangerous; the slash and débris allowed to remain as a menace to adjacent areas. Some one will grow a second crop of timber if the area is potential forest land; and, the State may assume control or even ownership of such areas.

A study of cut-over lands was made during the summers of 1912 and 1913. The holdings of twenty lumber companies were examined, representing a total of 929,407 acres. Approximately half of this total area is cut-over. The study included practically every lumber company now operating, exclusive of the redwoods, owning a total of 5,000 acres or more. The following few facts determined by the investigation are of special interest (figures relate to the twenty companies examined):

1. The general condition of cut-over land in California is such that the fire risk in the respective localities is increased almost to a maximum. Exceptions to this deserve much commendation.
2. Four companies employ an adequate system of patrols.
3. Two companies maintain lookout stations.
4. Two companies burn their slash each year.
5. Five companies dispose of their slash by other means. Much of the material is cut into cordwood.
6. Thirteen companies, owning a total of 256,840 acres of cut-over land do nothing to lessen the danger from fire.
7. Nine companies do little or nothing to extinguish fires originating on or threatening their cut-over lands.

The Redwood Region.

The commercial redwood has its range in a comparatively narrow strip extending along the coast from Monterey County to southern Oregon; the width of this redwood belt does not exceed forty miles. The rainfall is heavy in the coast counties and frequent ocean fogs add to the dampness of the vegetation. Consequently, the fire hazard in virgin redwood forests is comparatively small. However, protection is warranted on the cut-over areas where natural reproduction is freqeutnly subject to the ravages of fire.

Range.

Vast areas of range were fire swept during the past summer. Many of these fires originate in brush or on cut-over land, and result in a heavy loss to ranchers who depend upon the fall and winter forage for their stock.

Numerous summer resorts and country homes are threatened and destroyed each year by brush and range fires as well as by "forest fires." Three lives were lost during 1913 as a result of uncontrolled brush fires. So it is plainly apparent that protection is needed not only to preserve the merchantable forests, but also to lessen the annual loss of life and property throughout the State.

FIRE CONTROL AND DAMAGE.

In California, as in other states, the first important step in the practice of forestry is the protection of her forest property from fire. Fire damages and destroys timber and young growth, which, in many cases is not covered by insurance; consequently, the damage results in a clear loss to the owner. Each year our cut-over land area is increasing; practically nothing is done to eliminate the inflammable slash left after logging. This fact, together with the ever increasing number of people who visit the woods during the summer, makes the fire problem a serious one. No measures to insure the future forest resources of the State can be successful unless preceded by and founded on a system of forest fire control. The value of young timber and sprout land is increasing steadily, and coincident with this increase in value is an awakening interest in forest fire protection. Fires in large timber do not always destroy all of it, but the trees are killed, and in order for the owner to prevent a total loss, he must sell his dead crop immediately. But there is no way for him to realize any profit from the young trees killed and destroyed. Throughout nature the perpetuation of a species demands thrifty reproduction and then proper protection of the young. Hundreds of acres of thrifty young growing timber destroyed means the loss of hundreds of acres of full grown timber to some one in the future. It is the function of the State to provide for rather than permit the exploitation of future supply.

Classification of Fires in California.

For convenience in description the fires general in California are classed as follows:

- Timber Fires.
  - (*a*) Top fires.
  - (*b*) Ground fires.
- Brush Fires.
- Grass Fires.

Timber Fires.

So called when standing timber, old or young, is damaged or destroyed by fire.

(*a*) *Top fires.* This term is used when the fire rages through the tops of mature and intermediate trees.

(*b*) *Ground fires.* Very frequently timber fires burn their way along the ground consuming nothing more than the forest litter, such as leaves, moss and fallen branches; occasionally such fires follow up the dry bark of mature trees, but do not, as a rule, reach the tops. Ground fires can be readily controlled, if the wind is quiet, by the use of shovels and hoes; a trail can be cleared around the edge of the fire. Twenty men can control a large area under favorable conditions. If the wind is high a trail should be constructed several hundred feet ahead of the advancing fire line, and, if well supervised by a competent person, back-fired. In making such a trail it is best to throw all leaves and branches on the outside, otherwise a back-fire may assume dangerous proportions at its very start. Fighting a timber fire where the flames are in the tops is extremely difficult. About the only way is to open a trail by felling trees and allowing them to fall away from the fire. Often a top fire is kept up by the heat occasioned by the burning ground litter, so well directed back-firing may prove effective.

Brush Fires.

Perhaps no other class is more encountered in California than the fire which rages with terrific heat through chaparral, brush, the characteristic vegetation on many of our watersheds. These fires often burn for weeks uncontrolled, and may or may not do untold damage, besides the serious affect they have upon the watersheds. Fighting a brush fire is dangerous as well as difficult work. It is quite true that in a heavy wind a fire may jump many hundreds of feet; and, unless one is watchful, he may become surrounded by fire. First there must be some one in charge, a man whose familiarity with the country and his ability to organize action warrants his being a leader. Then he must have a force of men who are strong and willing to follow his directions without question. After deciding upon the best plan to follow, the man in charge should distribute his men where they can accomplish the best work. Quite frequently in brush fires it is necessary to cut wide trails from which to back-fire. These trails should generally be constructed along ridges—one should not try to make such a trail along a sidehill—but should follow straight up the hill to the nearest ridge, and then, if circumstances permit, keep on the ridge. In back-firing from a trail built down a sidehill the work should proceed down from the top and men stationed along at convenient intervals, as patrolmen, to keep the fire from crossing. Great caution should be exercised in back-firing. Careless and unplanned back-firing.should never be done. If home and property are immediately threatened, any measure to prevent its loss would seem proper and expedient; however, the consequences of a back-fire should always be considered. A back-fire may save one house and result in the destruction of many others. How much better it would be to clear sufficiently wide trails around our homes in forested areas before the fire threatens us, say during the winter and early spring. Much anxiety and often tremendous loss could be obviated in this way. The brush hook, shovel and ax are the best tools with which to equip a body of men engaged in fighting a brush fire. No recommendations can be more emphasized than that those who own homes and dwellings in the woods construct, immediately, fire trails around their respective properties.

Grass fires are likely to occur almost anywhere, and, since they usually lead rapidly either to brush or timber, it is essential to control them in their incipient stage. During a high wind a grass fire spreads with great speed, and unless it is possible to stop its progress along a road or trail already constructed it is almost impossible to check it otherwise. If the wind is not too strong a grass fire may be successfully controlled by the use of wet sacks, green boughs and shovels. Many other devices are useful; in some states chemical fire extinguishers have been successfully tried out. During the summer months the dry grass will ignite very rapidly, and extreme caution is warranted to prevent such an occurrence. Campers, hunters, picnickers, and all who frequent the forests, must remember that it is much easier to prevent a fire than it is to extinguish one.

Fires of any class are likely to occasion considerable damage, especially where preparatory provision has not been made to suppress them.

Under the present voluntary firewarden system, California has approximately 1,300 voluntary firewardens. These men are public-spirited citizens who are appointed by the State Forester for the purpose of directing crews of men in fighting fires in their respective localities. The appointment gives the firewarden the power to arrest, without warrant, violators of the State and Federal forest laws; the authority to call upon able-bodied men for assistance in fighting fires; and the authority to take charge of fire fighting. He must force men to work if they will not consent, and in either case he is unable to guarantee payment to his men unless he assumes the responsibility himself. Men fighting fire should be paid, and it is not unfair to assume that the duty of the State is to provide, at least in part, for the payment of men while engaged in fighting forest fires. A few counties endeavor to make compensation for work of this nature done within their boundaries. The State should assume part of the responsibility, and by so doing stimulate and encourage further activity by the counties.

The following table shows what has been expended by eleven counties during 1913. Protection is wanted, as is evidenced by county work and numerous applications made from power companies and private landowners:

Table No. 1. County expenditures for fire protection, calendar year 1913.

County	Patrol	Fire fighting	County firewardens	Total
Alameda	$1,700 00	$120 90		$1,820 90
Los Angeles		15 00	300 00	[1]5,315 00
Napa	500 00			500 00
Orange	500 00	150 00		650 00
Riverside		957 57		957 57
San Bernardino		50 00		50 00
San Diego		[2]4,481 30		4,481 30
San Joaquin	425 00	382 50		807 50
Santa Barbara		98 25	300 00	398 25
Santa Cruz		4,510 00	300 00	4,810 00
Tulare		9 50		9 50

[1] Los Angeles County gives $5,000.00 annually for the construction and maintenance of trails and fire breaks within the Angeles National Forest. This money is turned over to the Forest Supervisor, under whose direction it is expended.

[2] Expended for fire protection during the two fiscal years prior to June 30, 1913.

Endeavoring to accomplish effective results with the material afforded him, the State Forester has put the voluntary firewarden system to a test. This office and the State owes a debt of gratitude to many local voluntary firewardens whose generous and able work was instrumental in suppressing several threatening fires.

Although individuals have done commendable work, there is no doubt but that the system has failed to stand the simplest test. One great difficulty is the appointment of the proper men in the respective localities. Quite frequently a lack of ability as well as a lack of support presents itself relative to a firewarden after he has received his appointment. In order to simplify this difficulty an application blank is sent to each prospective firewarden. Heretofore, appointments have been made, promptly, upon the recommendation of any responsible and interested person. Application is now made under the following classification:

CLASSIFICATION OF APPLICANTS.

Class I. Employees of the U. S. Forest and Postal Services.

Class II. Field employees of the telephone, telegraph, power, mining, oil, irrigation, railroad and lumber companies on recommendation from an administrative officer of the company.

Class III. Paid field men of the State Fish and Game Commission.

Class IV. Paid field men of the County Fish and Game Commission.

Class V. Managers, superintendents and foremen employed on ranches and large estates.

Class VI. Officers and forest rangers of Forest Fire Associations of recognized standing.

Class VII. Public-spirited citizens interested in the prevention and suppression of forest fires, who, by virtue of executive ability, experience in fighting fire, and having the good will of the community can assemble and direct fire fighting operations. The recommendations of these applicants should be in the form of a petition signed by a representative number of landowners in the territory in which the firewarden wishes to serve, such landowners to be in possession of local property covered wholly or in part by inflammable vegetation.

A copy of this classification is sent with the following application form:

CALIFORNIA
STATE BOARD OF FORESTRY
SACRAMENTO

APPLICATION FOR VOLUNTARY STATE FIREWARDEN.

Name ____________________
Street ____________________
City ____________________, County ____________________
Date ____________________, 19____
1. What is your age? ____________________
2. Where were you born? ____________________
3. What is your nationality? ____________________
4. Are you a citizen of California? ____________________
5. How long have you been a citizen of California? ____________________
6. Have you had experience in directing men? (If so, state nature of work directed and amount of experience) ____________________
____
7. Under what class do you make application? ____________________
8. Have you ever fought fire (*a*) in brush? __________ (*b*) in grass? __________ (*c*) in timber? __________ (Answer yes or no.)
9. Are you addicted to the use of liquor? ____________________

If my application receives favorable consideration I will accept the appointment, having full knowledge that it carries no compensation; that it gives me the authority to call upon men for assistance in fighting fires; to arrest without warrant violators of the state and federal forest laws when such violation is committed in my presence; and to assemble, organize and direct fire fighting forces in the territory for which I am appointed. I know I have not the power to incur expenses against the State. I further agree that, since the appointment is indefinite as to term, I will submit my resignation and badge at any time that the State Forester may deem it expedient. I know that from time to time, for convenience of administration, the State Forester may see fit to terminate appointments and call in the accompanying badges. I further agree to report all fires of which I have knowledge on forms to be furnished by the State Forester, and to exert all due discretion in exercising my legal authority.

____
Signature of Applicant.

Causes of Fires.

In collecting accurate fire data it is advisable to keep the statistics in a uniform manner. Unless a standard classification is adopted by all states and federal organizations, there will undoubtedly be a different interpretation of the causes of fire. The classification used by the Federal Forest Service is admirable and will be adhered to by California.

Forest fires may be divided into those caused by man and those caused by lightning. A natural division of the fires caused by man separates those which are intentional, or incendiary, from those which are unintentional. Since by far the greater number of forest fires are of unintentional origin, these latter have been further subdivided, as shown in the following classification:

Table No. 2. Causes of fires.

Classification of the causes of forest fires.

[The heavy-faced type shows the terms used in reporting the causes of fires.]

- FOREST FIRES
  - Preventable; caused by man
    - Intentional
      - **Incendiary.**[1]
        - Maliciousness or wilful negligence.
        - Contempt for the law.
        - To cover crime.
        - To drive game.
    - Unintentional
      - Sparks or ashes from engines
        - **Railroads.**[2]
          - Passenger, freight, and work engines.
          - Steam shovels and plows.
          - Logging engines.
        - **Sawmills.**[3]
          - Permanent mills.
          - Temporary mills.
          - Portable mills.
          - Donkey engines.
      - Generally from uncontrolled fires
        - **Brush Burning.**[4]
          - Clearing lands or rights of way.
          - Slash, rubbish, or garbage burning.
          - Stubble or meadow burning.
          - Light burning.
        - **Campers.**[5]
          - Construction campers.
          - Recreation parties and picnickers.
          - Fourth of July parties.
          - Miners and prospectors.
          - Hunters and fishermen.
          - Stockmen, including branding and protection fires.
          - Berry pickers and nut gatherers.
          - Cruisers, surveyors, and river drivers.
          - Smokers, children, tramps, drunks, lunatics.
        - **Miscellaneous.**
          - Fires from burning buildings, or from prairie or other fires, if the origin of the original fire is not known. If origin can be determined it is classified accordingly.
          - Sparks from chimneys, and stacks other than those classified under "Railroads" and "Sawmills."
          - Blasting, except as covered by the classification "Brush burning."
          - From electric wires, unless accompanied by lightning.
  - Generally unpreventable
    - Spontaneous combustion, either chemical or mechanical.
    - **Unknown.**
      - Includes fires the cause of which is not determinable with reasonable certainty.
    - **Lightning.**

[1] Includes all fires that are intentionally set or due to wilful negligence, but not those due to carelessness, mischief, or ignorance. "Intentional," however, does not include back-firing with good intent, which is classed according to the origin of the fire being fought.

[2] Includes all fires caused by sparks or ashes from traction locomotives, but not from clearing of rights of way, which are reported under "Brush burning."

[3] Includes sparks from stationary engines, but not fires from logging locomotives nor from loggers while slashing, clearing, cooking, or river driving.

[4] Includes all fires incidental to the removal of litter or undesirable growth, unless wilful negligence is evident, in which case it is "Incendiary."

[5] Includes fires due to carelessness, mischief, or ignorance and fires started by Indians, but not fires started to drive game or to increase the grazing area. Such are "Incendiary."[*]

[*] U. S. Forest Service Bulletin No. 117, pages 8-9.

Since complete statistics have not been obtained in the recent past it is not possible to state positively the actual loss occasioned by forest fires. However, sufficient data has been kept to prove that our forests have suffered an appalling annual loss. The following table gives an incomplete record of forest fires in California since 1869:

Table No. 3. Forest fires in California.*

Year	Number of fires caused by—								Total fires	Area burned.	Damage		Remarks
	Railroads	Lightning	Incendiary	Brush burning	Campers	Sawmills	Unknown	Miscellaneous			Amount M. B. F.	Value	
1869							1		1			$10,000	Fragmentary record.
1871							1		1	23,000			Do.
1877							1		1	7,000			Do.
1879					1		1		2	37,000			Do.
1880			5	9	55				69	856,895		440,750	Tenth Census record.
1881			1		1		1		3	70,000			Fragmentary record.
1884							2		2	16,000			Do.
1885							1		1	150,000			Do.
1886							1		1		4	3,000	Do.
1887				2			6		8	109,200			Do.
1888					1		4		5			42,500	Do.
1889					1		5		6			319,000	Do.
1890							7		7	32,000			Do.
1891				1	1		3		5	402,000			Do.
1892					2		5		7	12,300			Do.
1893					1		4		5	115,100			Do.
1894							1		1			4,000	Do.
1895							8		8	67,300			Do.
1896							1		1	1,000		12,000	Do.
1897	1						7		8	56,000			Do.
1898					1		2		3	20,000			Do.
1899													No record.
1900							2		2	6,500			Fragmentary record.
1901									242	18,524			National Forest only.
1902									243	7,895			Do.
1902			1						1	15,000	21,000	75,000	Fragmentary record.
1903									167	13,246			National Forest only.
1904					1				1	600	12,000	18,000	Fragmentary record.
1905			1				1		2			230,500	Do.
1906	20	10	5	12	12			61	120	650,000			
1907	24	42		4	69		129	37	305	75,060	4,107	8,601	National Forest only.
1908	12	165	18	17	119		124	117	572	163,216	51,902	103,259	Do.
1908									1,096	505,416	170,482	478,259	
1909	64	79	39	45	150		250	11	638	357,269	40,000	600,000	
1910	11	110	59	29	63	11	204	66	553	367,344	209,946	407,569	Do.
1910										482,563			
1911	24	282	92	38	71	15	195	80	797	66,508	4,328	51,083	Do.
1912	109	226	86	72	117	29	233	126	998	156,241		31,906	
1913	77	881	158	106	275	50	294	130	1,971	559,370		511,077	

*Forest Service Bulletin No. 117, page 26, gives above figures through 1911.

Table No. 4. Showing number of fires by counties and causes.
(Outside National Forests.)

County	Railroads	Lightning	Incendiary	Brush burning	Campers	Sawmills	Unknown	Miscellaneous	Total
Alameda					1		1	2	4
Alpine		3							3
Butte							4	1	5
Calaveras		1			2		1	1	5
Del Norte			3						3
El Dorado					3		2		5
Fresno	4	13	1		8		3		29
Humboldt							1		1
Kern	1						1		2
Lake				2	1		3		6
Lassen		1					6		7
Los Angeles	1	2		4	5		4	1	17
Madera					1				1
Marin					4		1		5
Mariposa			1				9		10
Mendocino			6	3	7	1	8	1	26
Mono		1					1		2
Monterey					1		1		2
Napa				2	2		2		6
Nevada		6	1						7
Orange							1		1
Placer					2		3		5
Plumas		15		1				1	17
Riverside		20	1		5		1		27
San Benito				1	2				3
San Bernardino		1	2				4		7
San Diego		2	3	8	3		4	1	21
San Joaquin					2			2	4
San Luis Obispo				1			2		3
San Mateo					1	1			2
Santa Barbara							3		3
Santa Clara			1		2		1	1	5
Santa Cruz	2		3	4	2	1	16	2	30
Shasta	1	5		1	1	1	16	1	26
Siskiyou		4			2		1		7
Sonoma			1	1	2		3	4	11
Sutter	1								1
Tehama							3		3
Trinity		1	2						3
Tulare	1	2			1		2		6
Tuolumne	2						6		8
Ventura					1		2	1	4

Table No. 5. Showing number of fires by causes since 1906.
(Including Forest Service figures.)

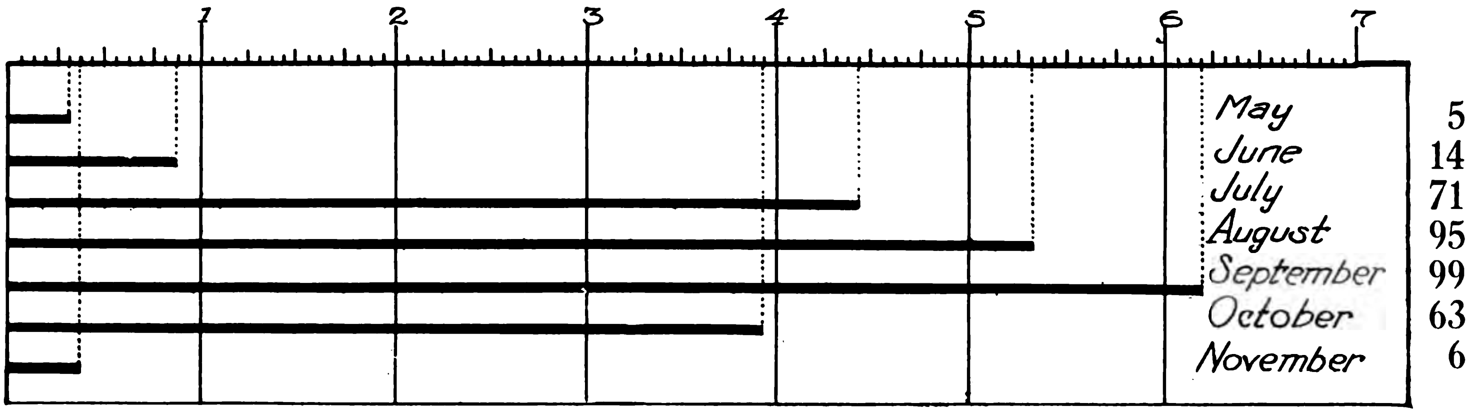
Year	Railroads	Lightning	Incendiary	Brush burning	Campers	Sawmills	Unknown	Miscellaneous	Total fires
1906	14	10	9	13	13	2	45	37	143
1907	20	9	14	25	24		79	82	253
1908	13	24	12	17	13	1	76	34	190
1909		79	39		143		250	127	638
1910	17	119	70	54	122	17	263	76	738
1911	27	317	126	66	109	17	272	130	1,064
1912	109	226	86	72	117	29	233	126	998
1913	77	881	158	106	275	50	294	130	1,971

Table No. 6. Number of fires by causes in 1913.

Location	Railroads	Lightning	Incendiary	Brush burning	Campers	Sawmills	Unknown	Miscellaneous	Total
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Inside National Forests	64	804	133	78	214	46	178	111	1,628
Outside National Forests	13	77	25	28	61	4	116	19	343
Totals	77	881	158	106	275	50	294	130	1,971

Table No. 7. Showing number of fires by months, 1913.*

(*1-16 inch=1 fire.*)



*This table indicates quite clearly the length of the fire season in California. The diagram includes but 343 fires, all of which occurred outside of the national forests. Special precautions should be exercised during July, August, September and October.

Table No. 8. Showing area burned over by types.

Location	Area burned over, acres				
	Timber	Brush	Grass	Open	Total
Inside National Forests	10,418			79,570	89,988
Private lands inside National Forests	3,443			30,028	33,471
Outside National Forests	47,821	303,542	84,548		435,911
Totals	61,682	303,542	84,548	109,598	559,370

Table No. 9. Showing cost of fighting fires, 1913.*

Temporary labor	$42,362 23
Guard and ranger labor	11,144 49
Tools, supplies, etc.	20,176 38

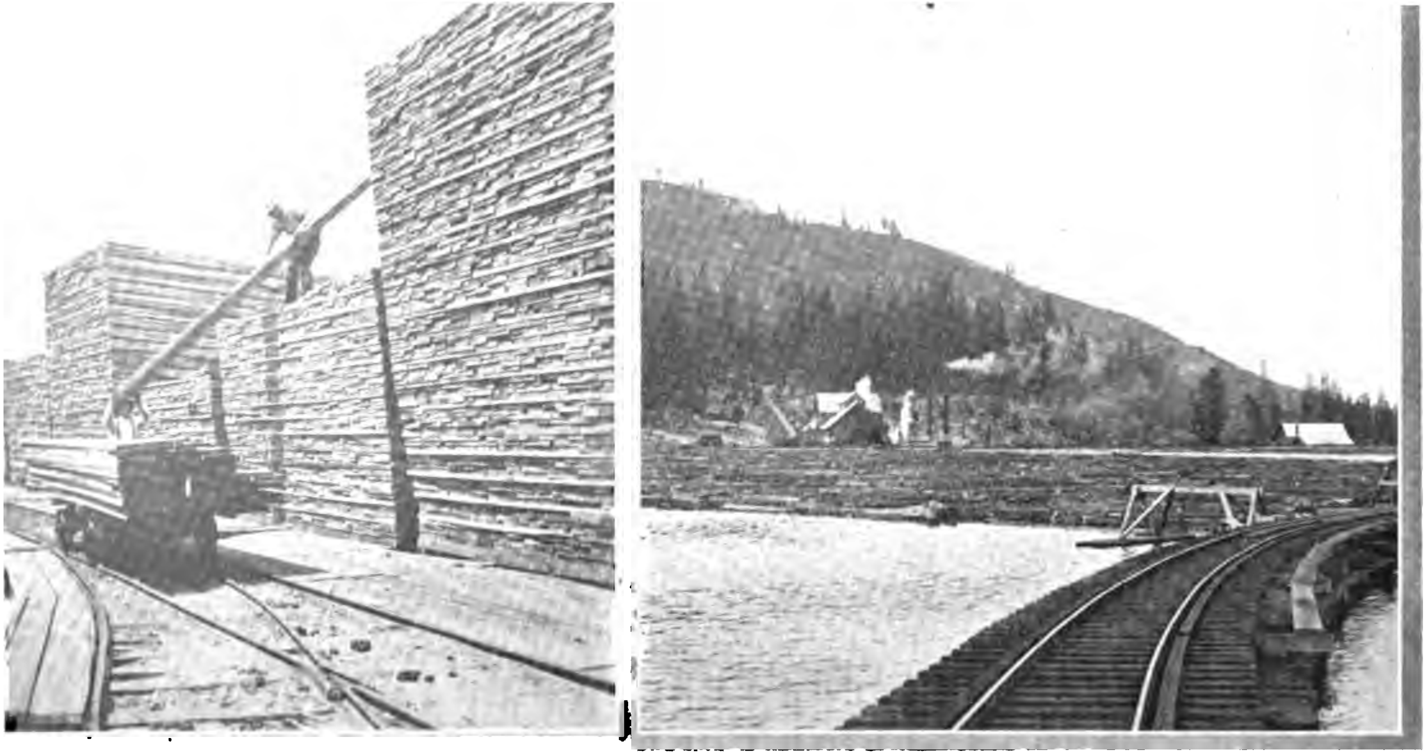
*On natural forests only.

Table No. 10. Showing money loss by forest fires in 1913.

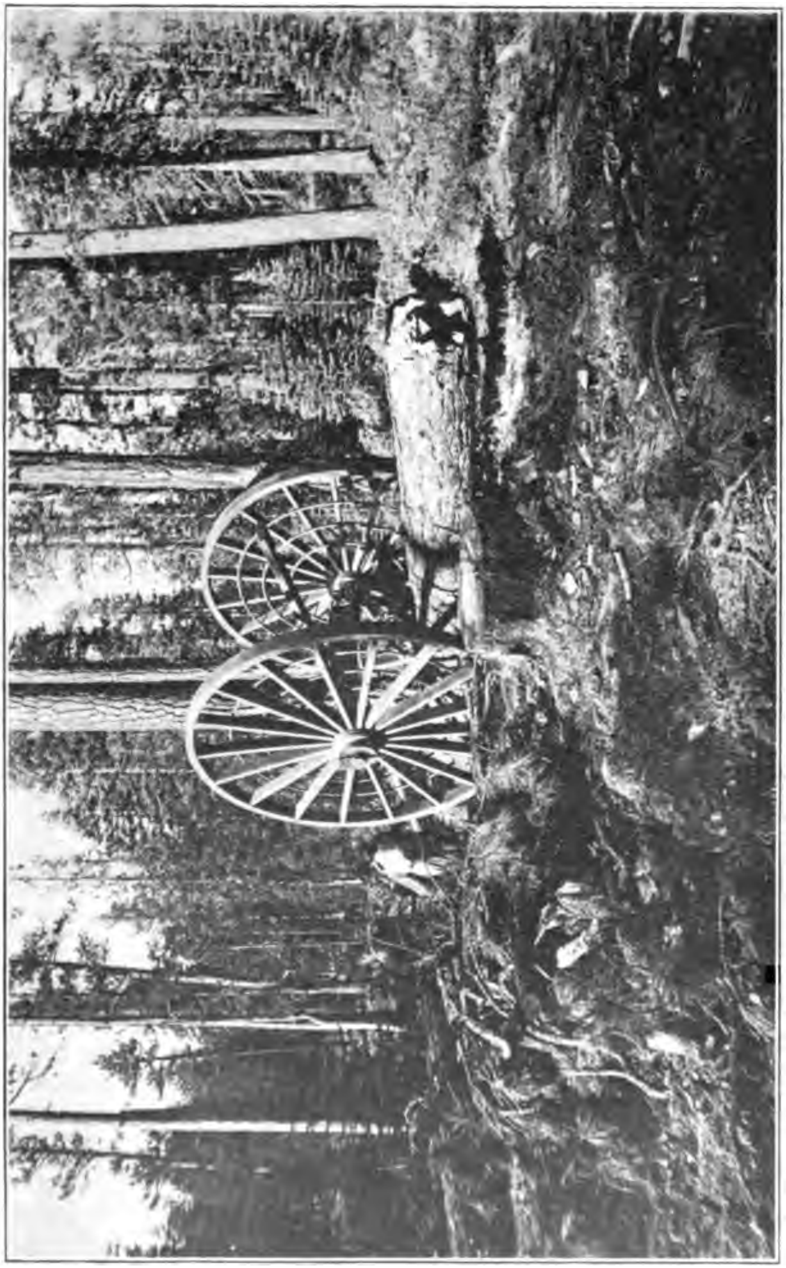
Location	Amount of damage				
	Timber	Range	Improvements	Reproduction	Total
Inside National Forests	$7,242	$410		$12,826	$20,478
Private lands inside National Forests	9,466				9,466
Outside National Forests	107,351	11,775	$362,007		481,133
Totals	$124,059	$12,185	$362,007	$12,826	$511,077

Table No. 11. Fire data for 1913. (Outside National Forests.)

County	Number of fires	Area burned over				Money damage			
		Timber acres	Brush acres	Grass acres	Total acreage	Timber	Range	Improvements	Total
Alameda	4	360	75	1,120	1,555			$6,020 00	$6,020 00
Alpine	3	7			7			20 00	20 00
Butte	5	160	71,940	10,514	82,614			5,100 00	5,100 00
Calaveras	5		5,720	800	6,520			460 00	460 00
Del Norte	3		31		31			200 00	200 00
El Dorado	5	100	393	210	703	$1,050 00		250 00	1,300 00
Fresno	29	2,520	7,200	4,140	13,860	922 00	$2,400 00	4,625 00	7,947 00
Humboldt	1		200		200				
Kern	2		5,000	3,980	8,980			750 00	750 00
Lake	6	2,700	10,250	2,100	15,050	2,200 00		5,600 00	7,800 00
Lassen	7	121	120		241	12 00		50 00	62 00
Los Angeles	17	1,235	8,117	1,000	10,352			7,900 00	7,900 00
Madera	1		60	20	80			200 00	200 00
Marin	5	200	2,800	60	3,060	1,200 00			1,200 00
Mariposa	10	930	2,407	1,940	5,277	40 00		3,000 00	3,040 00
Mendocino	26	5,682	9,900	120	15,702	9,800 00		2,280 00	12,080 00
Mono	2	101			101	10 00			10 00
Monterey	2	100	56,400	5,500	62,000	120 00	2,150 00	1,000 00	3,270 00
Napa	6	5,010	16,620	7,425	29,055	20,000 00	500 00	66,820 00	87,320 00
Nevada	7	4,100	8,700	14,900	27,700	5,000 00	2,500 00	5,500 00	13,000 00
Orange	1	25	975	1,000	2,000			94,248 00	94,246 00
Placer	5	4,166	10,740	8,264	23,170	10,569 00			10,569 00
Plumas	17	148	1	1	145	129 00			129 00
Riverside	27	640	18,042	4,999	23,681	1,200 00	1,500 00	26,625 00	29,325 00
San Benito	3	50	2,075	80	2,205		205 00		205 00
San Bernardino	7		814	70	884	120 00			120 00
San Diego	21	185	10,007	450	10,642	150 00		2,700 00	2,850 00
San Joaquin	4			1,285	1,285		1,000 00		1,000 00
San Luis Obispo	3		20	600	620			180 00	180 00
San Mateo	2	680	3,000	200	3,880	5,200 00		3,800 00	9,000 00
Santa Barbara	3	10	4,490	355	4,855			4,150 00	4,150 00
Santa Clara	5	33	68	10	111	270 00		25 00	295 00
Santa Cruz	30	7,778	39,108	500	47,386	48,126 00		100,140 00	148,266 00
Shasta	26	3,407	110	6	3,523	983 00	20 00	1,000 00	2,003 00
Siskiyou	7	1,210	2	1,927	3,139			320 00	320 00
Sonoma	11	418	1,315	2,782	4,515		500 00	15,000 00	15,500 00
Sutter	1			15	15				
Tehama	3		65	300	365				
Trinity	3	750			750				
Tulare	6		1,205	2,603	3,808			1,916 00	1,916 00
Tuolumne	8		162	270	432			200 00	200 00
Ventura	4	5,000	5,410	5,002	15,412	250 00	1,000 00	2,000 00	3,250 00
Totals	342	47,821	303,542	84,548	435,911	$107,351 00	$11,775 00	$362,007 00	$481,133 00



The lumber industry is exceedingly important and those who develop it are public benefactors. Its true development depends very largely upon making provision for its perpetuation. This cannot be accomplished without protection from forest fires.



Logging yellow pine in Lassen County. Logs are conveyed to the sawmill with 'Michigan Wheels." Tops and limbs should be burned to reduce the fire hazard for the protection of the remaining young trees.

DESCRIPTIONS OF A FEW AVERAGE FIRES.

AUBURN FIRE.

A fire broke out September 21st on the northern boundary of the E. A. Graham ranch in the Lone Star District, about seven miles north of Auburn.

Officers from the State Forester's office sighted an immense cloud of smoke from the train on their return to Sacramento from the Cohasset fire. They proceeded to Auburn on the morning of the 22d, located the fire by telephone, and after collecting tools and provisions drove to the Graham ranch. The fire had already burned north to Bear River, where it died out; further inflammable vegetation having been consumed by the fire of August 24th.

The fire, still burning unchecked, and driven by a terrific north wind, had already swept over a large area. Many of the buildings and all of the hay, fences, cordwood and range had been consumed on the area already visited by fire, while all of the country south as far as Auburn and Newcastle was in immediate danger.

Although fires in this region are an annual occurrence, no provision had been made for fighting one likely to encroach upon the more developed districts. No organization obtained and no definite plan of action had been formulated.

Adjacent ranchers hastened to the assistance of their neighbors, but their efforts were of no avail, so they retreated to their respective homes and back-fired around their dwellings and orchards, leaving the fire uncontrolled and passing it on to the next ranches south. Another relay would in turn hasten to their assistance, and the operation would again be repeated.

A hasty conference was held with such property owners as could be readily reached, and the word was passed along the line to cease back-firing and get together on both flanks of the fire.

With the county roads as a base trails were constructed on both flanks of the fire. As soon as a portion was completed back-firing proceeded slowly and carefully. Patrols were detailed to short stations to guard against the escape of the back-fire. The head of the fire was finally coralled by reinforcements of Auburn High School cadets. Those boys volunteered their services and arrived on the fire line early in the morning of the third day. The Forester joined them late in the evening. They had worked hard all day without food and but little water. A big supper was soon prepared for them, after which every one insisted upon working all night in order to complete the last section of trail that finally checked the fire. These boys were all freshmen and sophomores in command of a junior captain. Perfect discipline was maintained and splendid work was performed. The last danger point was made safe by three o'clock in the morning and at four o'clock the tired little fire fighters returned to the county road where they lay down in the dust, without blankets and some without coats, for a few hours' sleep, like real soldiers that they are. I can not commend too highly the manner in which these cadets executed their arduous task.

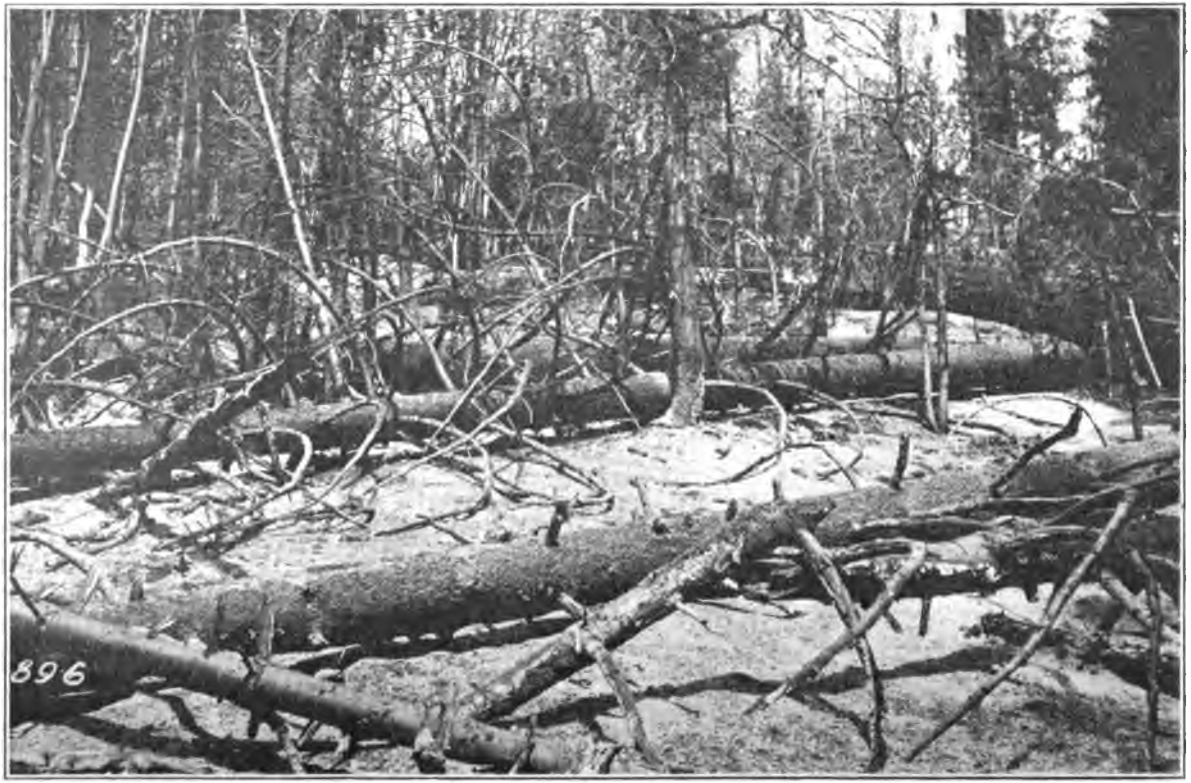
The origin of this fire is unknown, but there is reason to believe it was set maliciously. Mr. Graham had recently posted "No SHOOTING" signs on his 5,000-acre ranch, and this had occasioned considerable ill feeling in the vicinity.)

The area burned was heavily covered with pasture, brush and timber. The destruction of the pasture constitutes the greatest loss. Several farmhouses were burned, and many cords of wood, tons of hay and miles of fence. These losses fell more heavily upon those engaged in marketing cordwood. Some of the choppers lost all of their cordwood, which means their winter "stake" and efforts of the past summer. Approximately 30,096 acres were burned, of which 4,066 acres were timbered; 8,030 acres were range and the remaining 18,000 acres were brush. The total damage occasioned by this fire was $29,761.00. Buildings, fences and grass destroyed had a value of $19,596.00, and the timber, $10,165.00.

Immediately after the fire a ranch to ranch canvass was made to determine the extent and amount of actual damage. Some of the owners could not be located, but the following table shows the character and value of losses of those interviewed:

Name	Classification of losses						Value of loss
	House, number	Barn, number	Cabins, number	Cordwood, cords	Pasture, acres	Hay, tons	
Anderson, —.					Unknown		$25 00
Arralia, —.					Unknown		700 00
Barker, Tony	1	1					750 00
Brye, Fred					Unknown		20 00
French, Abb					Unknown		1,000 00
Fountain, —.					Unknown		300 00
Gamlin, John						30	1,200 00
Gardner, —.					Unknown		20 00
Graham, E. A.				15	5,000		3,105 00
Hibbe & Smith					Unknown		2,000 00
Hodson, —.					Unknown		200 00
Hodgson, Thos.					Unknown		25 00
Hubbard, A. H.					Unknown		20 00
Hubbard, A. M.					Unknown		75 00
Hubbard, W.					Unknown		20 00
Hubbard, W. W.					Unknown		10 00
Johnson, —.					Unknown		600 00
Kramer Bros.					Unknown		25 00
Lawrence, —.					Unknown		20 00
Mrs. May Estate					Unknown		30 00
Oast H. A.			4	150	150		1,350 00
Oast, H. C.		1		53	280	20	1,621 00
Painter, —.	1	1					1,000 00
Peterson, —.	1	1					1,200 00
Placer Land Co.					1,620		1,800 00
P G. and E.					Unknown		1,700 00
Powers Place					Unknown		20 00
Queen, —.					Unknown		20 00
Rasmussen, —.					300		200 00
Tomans, Mrs. P.					320		200 00
Walters, Geo.				20			140 00
Wilkins, S.				100	360		1,000 00
Total					8,030		$20,396 00

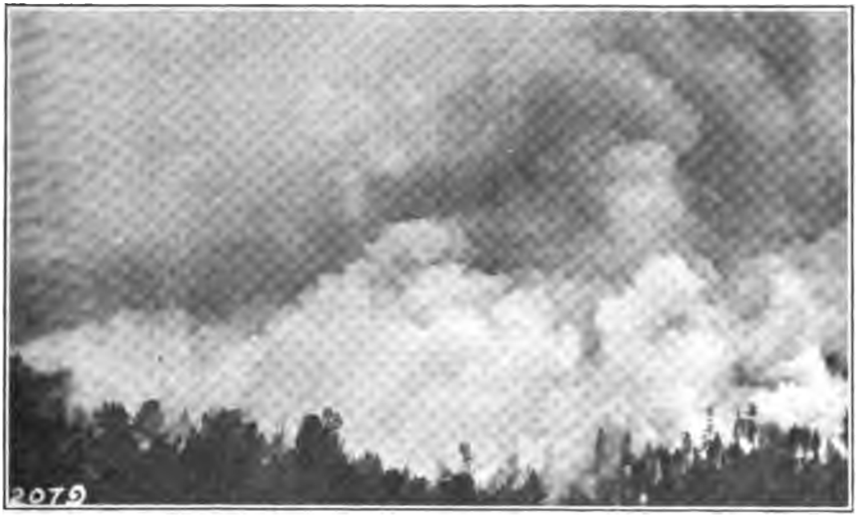
Making due allowance for general confusion, occasioned by the possibility of losing home and improvements, it was apparent that too little consideration was shown for the welfare of adjacent ranches by thoughtless and ill-advised back-firing. Turning fire loose in an effort



Pine forests of this size are readily destroyed by ground fires. Trees up to one foot in diameter are killed. The burned-over area, if again ignited, will cause a fire more intense than the first and carry it to areas covered with living trees. Such fires are difficult and expensive to control.

(Photo by Placer Forest and Home Protective Association.)

Our chaparral covered foothills are being converted into prosperous ranches; but—



the adjacent, unprotected areas are a constant menace to the live stock, forage, buildings and fences; and the lives of those engaged in this commendable pursuit.

to save one's own buildings without thought or regard for others may result in threatening the lives of persons unable to care for themselves. As a matter of fact an incident of this nature actually occurred, although none of the neighbors were aware of the fact. The Forester and a few helpers had just headed off one lead of a back-fire, between the irrigation ditch and road near Mr. Hubbard's ranch, when another lead of the same fire leaped into a pasture below us. Hastening to the new field of action we encountered an old gentleman, bent with age and rheumatism, striving unaided in a futile attempt to beat out the flames that were within a few feet of his house and barn. A lucky change of wind enabled us to save his home. This incident, though but one of many, shows forcibly the necessity for massing all available forces at the outset of a fire; of choosing leaders whose suggestions and plans of action will be followed; and especially the dangers resulting from uncontrolled back-fires.

BEAR RIVER DISTRICT.

The country drained by the upper portion of Bear River and its tributaries is an important watershed, and if properly protected will do much toward retarding run off during the season when the Feather and Sacramento rivers need to be relieved. Chaparral is the principal forest cover, intermingled with scattering oaks and digger pine.

The district is sparsely settled, and but little land has been cleared for ranch purposes. Stock ranging is the chief industry.

During the past fire season 19 separate fires were sighted in this district from the Banner Mountain Lookout Station near Nevada City. Although the exact cause of these fires is unknown, there is reason to believe most of them were of incendiary origin, set for the purpose of increasing range and for "getting even." Fires are so numerous and set so persistently that the Forest Supervisor has abandoned his policy of extending assistance in suppressing them. The rangers assemble on the border of the Tahoe Forest and make their fight when these fires threaten government lands. Voluntary cooperation is inadequate to handle the situation, and better conditions are not looked for until a paid state patrol is installed.

The fire of August 24th assumed alarming proportions and threatened many ranches adjoining this district. Over 6,400 acres were burned, destroying 2,200 acres of pasture, 400 cords of wood, 3 ranch houses, 2 barns, a few head of cattle and a great deal of fencing. The total damage was approximately $10,800.00.

BRYSON FIRE.

Monterey and San Luis Obispo counties.

In the morning of Monday, August 18th, a fire started on the northeast slope of the Nacimiento River Canyon, at a point about two miles and a half from the post office at Bryson, Monterey County. Several of the local residents endeavored to extinguish the blaze, but were baffled in their attempt by a stiff southwest wind. The fire, raging uncontrolled, worked its way slowly southward toward the mouth of the Nacimiento River, taking brush and timber, and leaving the watershed perfectly bare. Its progress northward was more rapid because in this direction the flames were carried by the wind.

The region threatened is one of scattered settlement, and, although the fire burned over a great area, surprisingly slight damage was done. Stockmen constitute the majority of settlers in this vicinity, and there is reason to believe that the fire was of incendiary origin; however, legal action could not proceed owing to the fund of merely circumstantial evidence obtained.

Bradley is the nearest railroad town to Bryson, the distance between the two towns being about 25 miles. There are two voluntary state firewardens at Bradley and another at Jolon, a town toward which the fire was burning.

On August 25th the following telegram was received by the State Forester from the firewarden at Bradley:

> "*State Forester, Sacramento, California.*
>
> Am I authorized to compel men to fight fire without compensation? County around Bryson is on fire and endangering homes. Been fighting for five days; men are exhausted."

This information should be in the possession of every firewarden; it is contained in the fire laws, copies of which they are supplied with. However, realizing that the situation might be serious, the State Forester sent the following reply:

> "You may compel men to fight fire without compensation unless they are prevented by good and sufficient reason. Failure to comply with your request is punishable by fine or imprisonment, or both."

On the 25th the fire was still raging, and had burned over several thousand acres; the two firewardens, together with the local people, fought for hours, back-firing and retreating as the flames defeated their work. On the following day the fire was several miles north of Bryson and burning toward the Monterey Forest Reserve. At noon of the same day a second wire came to Sacramento reading as follows:

> "*State Forester, Sacramento, California.*
>
> Fire is getting away. Appeal to the U. S. Government for mounted troops. We need two hundred men and food for same. Fire is in Monterey and San Luis Obispo counties southwest of Jolon. Wire me at once when to expect them."

In the mean time the State Forester had left Sacramento, directing his attention to another section of the State. Two assistants were in the office and sent the following reply:

> "Impossible to secure troops. Wire extent and danger of fire. Get in touch with Forest Service men at Jolon. If necessary will send man from this office to take charge."

An immediate request for a man to take charge followed, and the Forest Inspector, then in the office, took the first train south, arriving at the fire the following afternoon. All was confusion. The fire, still raging, threatened homes and thousands of acres of pasture. A stand was made in Burnett Creek and a back-fire set; the men, now in charge of one man, doing excellent work. The back-fire was proving effective and the progress against the flames gratifying when a sudden shower came as a timely relief and completely extinguished the whole fire.

About 200 men were engaged in the fight. Approximately 60,000 acres were burned over with surprisingly little damage sustained. Several deer and other wild animals were killed during the fire; many, retreating into a narrow gorge were, undoubtedly, overcome by the intense heat.

Often, panic stricken by the sense of helplessness and the lack of one whose duty it is to direct, a community becomes confused; no one knows what to do or where to turn. The possibility of such an occurrence can be obviated by a system of paid state patrols and firewardens whose duty it shall be to assist in just such an emergency.

CASCADE CREEK FIRE.

The Cascade Creek fire was started on the first of October by the burning of a sawmill belonging to Mr. Rensler Steel. Apparently little or no effort was made to corral the fire in its incipiency and two leads soon developed; one burning northwestward along Cascade Creek, the other assuming a westerly direction and threatening White House Creek watershed. No response was made to the first call for outside assistance, since the firewarden of Santa Cruz County was under the impression that the fire was burning in Santa Clara County. On October 6th an agent from the State Forester's office was notified; he immediately enlisted the assistance of Mr. Creed, a voluntary state firewarden, and, with the added able support of Mr. Taylor and Mr. Rensler Steel, voluntary crews were organized and the work of controlling the fire quickly outlined. It was necessary to cut fire trails, and this work proceeded slowly, owing to the difficulty in securing relief forces. The wind, increasing in velocity, caused the flames to jump across the trails, and soon the fire threatened the beautiful California Redwood Park. Fully aware of the confronting danger, Park Warden Dool succeeded in constructing a trail along the ridge separating White House and New Year creeks; this trail served as an effective barrier between the fire and the park.

Having baffled many attempts to restrict its progress, the fire was finally brought under control eleven days after its beginning. Approximately 2,000 acres were burned over; of this area 200 acres were covered with redwood forest, while chaparral with scattered pines and oaks formed the vegetative cover on the remaining 1,800 acres. Improvements destroyed represent a money loss of $4,000.

This fire is cited as an example of many which are allowed to burn unrestricted for several days before recognition is taken of their danger. Had wind conditions been adverse there is little reason to doubt but that this fire would have destroyed a portion, at least, of the Redwood Park. No greater mistake can be made than to rely upon a forest fire with the assurance that it will "burn itself out."

COHASSET FIRE.

Butte and Tehama counties.

A fire of unknown origin was discovered burning in Brush Creek near Laurel Mound. The region is not thickly settled and is heavily covered with chaparral and timber. Sighted on the morning of September 17th, it was disregarded until the following day, when, with a sudden rise in the wind, the fire assumed alarming proportions, taking two distinct leads, one threatening the Plumas National Forest on the northeast, the other endangering all the country south to Keefer's mill.

Realizing the oncoming danger, the people of Cohasset and vicinity, together with the employees of the Vilas Lumber Company, and under the direction of Firewarden Conway, banded together in an attempt to stop the fire before it could cross the Cohasset road south of Woodruth's ranch. Working day and night the men were soon exhausted and without provisions. The following day brought no encouragement; on the contrary, the wind, still high, carried the fire across Rock Creek and simply added to the difficulty of bringing the flames under control.

An appeal was made at once to the State Forester who, with an assistant, went immediately to the scene of the fire. During the night a stand was made along the north side of the Cohasset road between Woodruth's ranch and Keefer's mill, but on account of the damp night air it was impossible to start a back-fire that would burn a strip sufficiently wide to prevent the fire from crossing the road next day. By the following afternoon the fire had taken a great lead to the south, and, running wild, was threatening everything in its path from Richardson's Springs south. Even Chico was threatened. Realizing the utter uselessness of endeavoring to combat the flames with the small force of men, a call was sent to Chico for more men and the district attorney dispatched reinforcements at once. In the mean time provisions were secured from Cohasset.

About five o'clock in the afternoon, with renewed vigor, the men, well in advance of the fire, succeeded in constructing a trail sufficiently wide to check the flames. This trail was continued until the entire fire was surrounded. The Government rangers efficiently handled the north end of the fire, since it threatened the Forest Reserve.

Although the blaze did comparatively little damage to standing timber and improved property, it proved a great loss to the cattlemen, since practically all of the fall and winter forage was consumed. A total number of approximately 200 men were engaged in bringing the fire under control; many offered their services, some were forced into action, while others were paid by the counties. To employ and feed an equal number of men for fighting this fire would have cost $2,400.00. Improvements, consisting of corrals, fences, telephone lines and cabins, amounting to about $5,000.00 were destroyed. The fire covered over 80,000 acres, of which more than 20,000 acres were pasture. Aside from the above losses great quantities of cordwood were consumed.

HEMET FIRE.

Riverside County.

The town of Hemet is situated in Riverside County about thirty-five miles southwest of Riverside. The region is one of scanty vegetation, chaparral and sage predominating. The hills to the south are covered with a comparatively unbroken growth of sage, valuable to the bee industry because of the very high grade of honey obtained from its blossoms.

A fire started Sunday morning, August 3d, near Sage post office, 13½ miles due south from Hemet. The origin of the fire is attributed to lightning which was seen to strike a tree on a homestead belonging to Mr. Thomas Rawson, a voluntary state firewarden. Mr. Rawson immediately gave an alarm and soon had 42 men under his direction fighting the fire. A stiff breeze from the southeast drove the flames westward, and the fight lasted a week before the men finally succeeded in extinguishing the fire. Most of the fire fighters were local ranchers, many of whom experienced considerable loss. The area burned lies between the canyon bottom and the county road extending along the top of a ridge; approximately 4,800 acres were fire swept.

Aside from the damage done by exposing the watershed, the greater loss incurred was the destruction of a large portion of the bee industry. Five hundred hives were consumed, together with several head of cattle; the value of the bees alone amounted to $25,000.00. The destruction of sagebrush is not usually considered a material loss, and one frequently hears that such fires cause no damage. In this case, however, it means that the bee men are deprived of range for approximately three years, this being the length of time required for the sage to blossom again to a commercial extent. Stock range, on the other hand, will afford pasture the season following the fire.

Riverside County recognizes its responsibility in affording prompt assistance in suppressing such fires, and, in this case, made timely settlement of all claims for fire fighting services at the rate of 25 cents per hour. Many of the men refused to accept compensation.

Throughout the fire a lack of preparation and necessary equipment requisite to such an emergency was evident. The fact remains undisputed that an organized system of fire protection would have prevented much of the damage sustained.

NAPA VALLEY FIRE.

Napa County.

About noon of September 22d a fire broke out on the C. H. Kuhn ranch in Soda Creek Canyon not a great distance northeast of the city of Napa. Brush burning under unfavorable conditions is supposed to have been the cause of the fire. Owing to the velocity of the wind at the time, the flames spread rapidly through the dense chaparral and low vegetation, taking a general course toward the south, and later extended to the southwest, where they skirted the northern portion of Capell Valley. Here a dairy barn belonging to C. H. French and valued at $2,000.00 was destroyed. Other ranch property was threatened and large quantities of cut and standing cordwood were consumed.

Two distinct leads developed at this point, one continuing toward the south and the other striking to the west and sweeping its way over the summit into Napa Valley. Everything in the path of the fire was destroyed; houses, barns, vineyards, fences, cattle, horses and small timber.

The high wind continued, and all efforts on the part of the local people to control the flames were defeated. Shortly after crossing the summit the flames surrounded and consumed a home occupied at the time by a mother and her little daughter, the only other person being a small boy thirteen years old. The latter was fortunate in finding successful shelter in the green and non-inflammable branches of a fig tree. The woman sought refuge with her child in the cellar of the house and both perished when the dwelling burned over them.

and noted for its numerous summer resorts.

Having succeeded in subduing the fire, most of the men withdrew and in the mean time a portion of the burned area in the canyon was diately gave an alarm and soon had 42 [illegible] direction fighting

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house and both perished when the dwelling burned over them.

An appeal was then made, and in response the state militia aided in bringing the fire under control. Splendid and effective work also was done by the large number of citizens who assembled in Napa and volunteered their assistance. So far the fire had burned over an area nearly ten miles long and three miles wide, having destroyed twelve ranches, including the famous Sunset Villa and wine cellar, which alone was valued at $25,000.00. Believing the fire to be entirely out the fire fighters, including the state militia, withdrew.

On the morning of September 30th, three days later, the fire again broke out, this time toward the north, threatening numerous ranches, resorts and county homes. An appeal was made to the State Forester to urge the Governor to summon the state militia again. This was done, and, in an endeavor to assist further, the State Forester sent a representative from his office to take charge. The latter arrived at Rutherford in the afternoon of September 30th, and was taken immediately to the north end of the fire, where he enlisted the assistance of a portion of the hospital corps, already on the ground and under the command of Captain C. H. Bulson. Dividing the work the Forest Inspector remained on the northwest wing of the fire with a detachment of the militia, while Captain Bulson with the rest of his men directed his attention to the east side of the fire, then threatening Chiles Valley. The fight against the flames continued all night and by morning the northwest border was entirely under control, having been back-fired in Sage Canyon. Forces then united and the fire was soon entirely surrounded and patrols stationed at certain intervals to guard against further outbreak.

This fire, as one, proved the most damaging fire of the season. The total money damage amounted to approximately $80,500.00, including the loss to improved property, stock, range and cut and standing timber. This loss appears but trivial when compared with the deprivation of two human lives. Many of those whose homes were burned were left penniless and are being cared for by a relief fund contributed by the residents of Napa Valley. More than 16,000 acres were burned over, and a fire fighting force of over 300 men were required to bring the fire under control. The work of cutting fire trails and back-firing cost the State approximately $500.00. The county also spent about $500.00 in settlement of claims to fire fighters and in supplying provisions.

ZAYANTE, LOMPICO AND NEWELL CREEK FOREST FIRE.

Santa Cruz. County.

About noon on Saturday, October 11th, a fire, set for the purpose of burning slash and chopping near the fork of Newell Creek, became uncontrollable and spread southeast toward the headwaters of Lompico Creek. A force of men from the Santa Clara Valley Mill and Lumber Company's mills responded to an immediate call for assistance.

The region is characterized by comparatively rough topography and is traversed by the Santa Cruz branch of the Southern Pacific Railroad, a section exceptionally attractive by virtue of the many scenic features encountered. The area is quite heavily covered with redwood timber and noted for its numerous summer resorts.

Having succeeded in subduing the fire, most of the men withdrew and in the mean time a portion of the burned area in the canyon was overlooked. Here the flames broke out again, taking a lead to the northwest in the direction of Bear and Deer creeks. Placing all attention now to the north end of the fire, the men, thinking the south end entirely extinguished, were again surprised to find the latter raging in the opposite direction and threatening homes along the railroad. A ranchman whose property lay in the path of the flames set a back-fire around his place and permitted it to spread unattended in all directions. This is shown on the map which has been prepared to give some conception of the extent of the area burned over.

On Sunday, October 12th, another fire started in Zayante Canyon, near Tank Siding, and a second damaging back-fire was set by a rancher. This resulted in enlarging the line of the main fire and in threatening Felton and Mount Hermon. These cases merely exemplify many similar instances where individuals, intent upon saving their own property, set back-fires with total disregard for other life and property adjacent to them.

The Santa Cruz County firewarden assembled a fire fighting force and did all in his power to bring the fire under control. Realizing the seriousness of the situation, the Southern Pacific Company sent a special train with a crew of 150 men and tools and provisions. The State Forester and an assistant from his office were on the ground, and, with the firewarden, took charge of the fire fighting. The railroad company willingly offered its assistance in turning the men over to the State Forester and in giving him the use of the special train. Trails were cut and back-fires set where such were advisable; however, quite frequently defeated in their purpose, the men were forced to retreat and another stand would be taken before the advancing line of fire.

By virtue of several indiscriminate back-fires there were five separate fires, each of which threatened to do considerable damage. On October 22d these were all brought together and completely surrounded, leaving the total burned area as shown in the map.

The fire resulted in a total loss of approximately $142,410.00. No money value can be given to the great loss occasioned by marring the landscape along the railroad; what once was a verdant forest is now, and will be for several years, a desolate expanse of bare slopes and unsightly stumps. It cost Santa Cruz County $2,400.00 to fight this fire. The Southern Pacific Company spent $2,000.00 and an additional expenditure of $4,000,00 was made by the Santa Clara Mill and Lumber Company. In all the cost of fighting the fire amounted to approximately $8,500.00.

The following is a list of the principal property holders and the damages they sustained:

Santa Clara Valley Mill and Lumber Company		$50,000 00
S. P. R. R. C., 6 culverts at $75.00	$430 00	
S. P. R. R. Co., damage to signal line	400 00	
		830 00
Western Union Telegraph Company		400 00
Happyland, portion burned almost a total loss		36,000 00
A. D. Clink, timber		1,000 00
C. H. Christianson, timber		3,000 00
P. Bryant, property loss		3,000 00
Paul Kenville, property loss		2,500 00
P. S. Stratton		250 00
Four bridges at $250.00 each (loss to county)		1,000 00
Additional timber loss		36,000 00
Cost of fighting fire		8,430 00
Total loss		$142,410 00

The total area burned over was 8,320 acres.

PROSECUTIONS.

Thirty-seven arrests were made during the year 1913 for violations of the State and Federal forest laws. This is little indication of the great number of individuals who have disregarded, intentionally or otherwise, the forest laws, and, by virtue of insufficient evidence against them, escaped prosecution. In twenty-one cases fines were imposed and collected; in one case the offenders were acquitted and eight cases were dismissed. In six cases the fines of the guilty offenders, because of various circumstances, were suspended on condition that similar offenses would not be committed again. One case has been appealed to the Superior Court.

Many of the firewardens realize the comparative uselessness of bringing cases into court in certain localities because of the attitude taken by many of the justices. There seems to be a peculiar conception, in parts of the State, of the real importance of forest fires. Their danger is not fully appreciated. The laxity with which many cases are prosecuted is largely responsible for the increase of incendiary fires. This office has information which tends to show that many of the fires reported were of incendiary origin. They started, for the most part, in remote places and by the time a volunteer fire crew could assemble and reach the scene, no definite clew could be established.

It has been demonstrated that the volunteer firewarden system is inadequate to prevent many of the larger fires and to successfully prosecute the offenders. A paid fire patrol, maintained by the State, would undoubtedly reduce the number of incendiary fires, and would also result in the apprehension of a greater number of offenders. Provision should be made for the inspection of donkey engines, locomotives, sawmill stacks and traction engines to insure the application of effective spark arresters. The failure to use spark arresters has been responsible for the origin of many fires not formally reported.

The following table shows the counties in which the thirty-seven cases were tried, and the disposition made of each case:

Table No. 12. Fire prosecutions for calendar year 1913.

Case	County	Tried by—	Place of trial	Fine	Sentence	Remarks
1	Butte	U. S. Commissioner Webster	Stockton		On parole for 1 year	
2	Los Angeles	Judge McDonald	Pasadena	$150 00		
3	Los Angeles	Judge McDonald	Pasadena	100 00		Leaving camp fire unextinguished.
4	Los Angeles	Judge McDonald	Pasadena	25 00		
5	Los Angeles	Judge Dunham	Pasadena	50 00		$25.00 suspended.
6	Los Angeles	Judge Dunham	Pasadena	50 00		Leaving camp fire unextinguished.
7	Los Angeles	Judge of Juvenile Court	Los Angeles		To remain out of mountains for 1 year	Leaving camp fire unextinguished.
8	Los Angeles	Judge Wilbur	Los Angeles		On parole for 1 year	Leaving camp fire unextinguished.
9	Los Angeles	Justice of Peace	Los Angeles		Severely reprimanded	Leaving camp fire unextinguished.
10	Los Angeles	Justice of Peace	Pasadena	50 00		Leaving camp fire unextinguished.
11	Los Angeles	Deputy District Attorney	Pasadena			Dismissed.
12	Los Angeles	Judge McDonald	Pasadena	50 00		Leaving camp fire unextinguished.
13	Los Angeles	Judge Halloway	Monrovia			Dismissed.
14	Los Angeles	Judge Glover	Azusa			Dismissed.
15	Los Angeles	Judge Dunham	Pasadena			Dismissed.
16	Los Angeles	Judge Dunham	Pasadena			Dismissed.
17	Los Angeles	Recorder Perry	Sierra Madre	20 00		Leaving camp fire unextinguished.
18	Los Angeles	Judge McDonald	Pasadena	50 00		Leaving camp fire unextinguished.
19	Los Angeles	Judge McDonald	Pasadena	50 00		Leaving camp fire unextinguished.
20	Los Angeles	Justice of Peace	Pasadena			Dismissed.
21	Los Angeles	Judge Dunham	Pasadena	50 00		Two arrests made; 1 fined, other dismissed.
22	Los Angeles	Judge Dunham	Pasadena	50 00		Leaving camp fire unextinguished.
23	Nevada	Justice Lee Garth	Nevada City			Dismissed.
24	Riverside	Justice J. F. Kelly	Ramona	50 00		Brush burning, $30 suspended.
25	San Bernardino	Justice Pittman	San Bernardino		15 days' imprisonment	Brush burning.
26	San Bernardino	Jury	Redlands	50 00		Case appealed to Supreme Court.
27	San Bernardino	Justice of Peace	Uplands	50 00		$25.00 suspended.
28	San Bernardino	Justice of Peace	Uplands	50 00		$25.00 suspended.
29	San Diego	Justice P. J. Wisdom	Escondido		On parole for 6 months	
30	San Diego	Justice J. F. Kelly	Ramona	50 00		$25.00 suspended.
31	San Diego	Justice P. J. Wisdom	Escondido	25 00		

32	San Diego	Justice J. F. Kelly	Ramona	50 00	20 days' imprisonment	Jail sentence suspended.
33	San Joaquin	U. S. Commissioner Webster	Stockton		On parole for 1 year	
34	Santa Cruz	Jury	Watsonville			Acquitted.
35	Shasta	Justice Silvester	Sisson	50 00		Brush burning.
36	Sonoma	Justice C. J. Raymond	Healdsburg	50 00		
37	Trinity	Judge Coffman	Carville	50 00		Leaving camp fire unextinguished.
				$1,170 00		
				130 00		$130 suspended.
	Total amount	of fines collected		$1,040 00		

QUESTIONS AND ANSWERS.

In order that a fund of information relating to the forests and forest areas of California be presented in a concise form the following list of questions and answers has been prepared:

Q. What is the area of California?

A. The total acreage of the State is 101,310,080 acres, of which 99,898,880 acres are land surface and 1,411,200 acres are water surface.

Q. What is the acreage of forest land in California?

A. Approximately 20,604,000 acres.

Q. How many acres of forest land in California are owned by the Federal Government?

A. There are nineteen national forest reserves in California representing a total area of 12,104,000 acres.

Q. How many acres of forest land are privately owned?

A. Approximately 8,500,000 acres.

Q. How many acres of merchantable forests are there in California?

A. Approximately 12,786,306 acres.

Q. How many acres of state forests have we?

A. California has no state forests.

Q. How would it be possible for the State to acquire forest areas?

A. By purchase or by obtaining title to lands upon which the taxes are delinquent.

Q. What is the status of the present forest law?

A. It is weak and unsatisfactory in that the State Board of Forestry may not make rules and regulations; that no provision is made for an adequate system of forest protection; the maintenance of experimental stations, and the acquirement and management of state forests.

Q. Are the forests outside the national reserves well protected?

A. No. Because the State depends on a system of voluntary firewardens who serve without pay. This can not be an efficient system since it is unjust to assume that a man should neglect his business to fight fire in territory remote from his own property without compensation.

Q. Then it is apparent that a paid system of protection is necessary; how can the people of the State secure proper forest protection?

A. (1) By urging their respective senators and assemblymen to support forest legislation which makes provision for adequate state protection; (2) By organizing local associations with the purpose of clearing fire trails and imposing community restrictions which will prevent fires getting beyond control.

Q. What is slash?

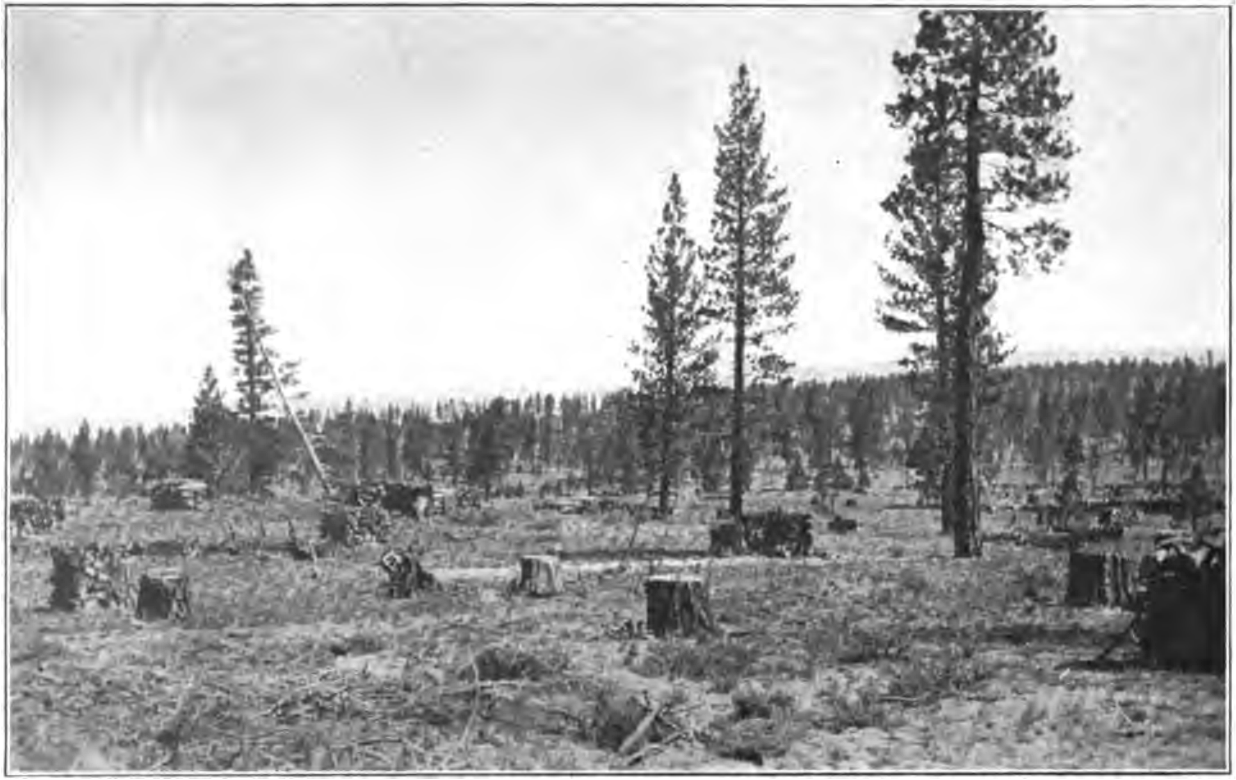
A. The term is applied to the tops, limbs, bark and broken logs left in the woods after logging.

Q. Why is slash, when allowed to remain, a menace?

A. Because it invites fire and burns with such intense heat that reproduction is killed; fires frequently spread from such material into standing timber where untold damage may be done.

Q. How can slash be disposed of?

A. If market conditions permit much of the slash can be cut into cordwood and the remaining small branches piled and burned under



Logged yellow pine area. Tops and large branches were converted into cordwood and the remaining débris burned. Seed trees have been left to restock the area and small trees were left for future marketing.

Natural restocking of a protected logged-off area. We must look to such small trees for our future lumber supply. Is it not obvious that they must be protected from destruction by uncontrolled forest fires?

proper supervision. Otherwise, it should all be piled immediately after logging and burned after the first rains in late fall or early winter. Such burning may continue until late in the spring.

Q. What losses are occasioned by forest fires?

A. Such fires frequently result in the loss of human life, public improvements, timber, game, homes, valuable watershed vegetation, orchards, live stock, forage, and vegetation upon which the bee industry depends.

Q. What is the length of the fire danger season in California?

A. From May 15th to October 15th.

Q. What are the "six rules" which, if followed, will decrease the number of forest fires?

A. The six rules are:

1. Be sure your match is out before you throw it away.
2. Knock out your pipe ashes or throw your cigar or cigarette stump where there is nothing to catch fire.
3. Don't build a camp fire any larger than is absolutely necessary. Never leave it even for a short time without putting it OUT with water or dirt.
4. Don't build a camp fire against a log or tree. Build a small one where you can scrape away the needles, leaves or grass from all sides of it.
5. Don't build bonfires. The wind may come up at any time and start a fire you can not control.
6. If you discover a fire, get word of it to the nearest State Firewarden or Forest Officer as quickly as you possibly can.

Q. What damage does the Nation sustain from forest fires?

A. Forest fires, in the United States, according to the most conservative estimates since any records were available, have caused an average annual loss of seventy human lives and the destruction of merchantable timber to the amount of $25,000,000.00.

Q. Does California receive any money from the Federal Government under the Weeks law provision?

A. Not a dollar.

Q. Why?

A. Because the provision demands that every state to receive money under this law must first appropriate a forest protection fund from her own treasury.

Q. And has California no forest protection appropriation?

A. Not a cent has been provided as a forest protection fund.

Q. Why has no money been set aside for forest protection?

A. Because the people who would greatly profit from forest protection have failed to support proper and needful forest legislation.

Q. What are the essential features of a state forest protection plan?

A. (1) The State should be divided into districts over which a competent district firewarden should have supervision. To do this he should devote his entire time to the work and be a salaried man. (2) There must be an appropriation to cover expenses of fire fighting and fire patrol. Firewardens should be paid for the work they do in performance of their legal duty. (3) The State should be able to cooperate with counties and private associations by paying a portion of the expenses incurred fighting fires within the respective counties.

(4) Lumbermen should be expected to so conduct their operations that their logged-over areas will not remain a menace to adjacent territory. (5) The State Forester should be permitted to carry out a systematic plan of protection with the approval of the State Board of Forestry.

Q. Did the last forestry bill contain these provisions?

A. Yes.

Q. The bill did not pass the assembly; what was the chief opposition to it?

A. There are those in the State who do not welcome state supervision of the forests. Many of these men are lumbermen who are afraid that a state protective plan will cost them a lot of money, and prefer to antagonize rather than appreciate the fact that the State invites their cooperation and friendly suggestions. The State merely seeks that which is economic and just, not to oppress.

Q. Is no protective work done by lumbermen in California?

A. It is true that a few of the lumbermen practice cautious and economic methods of logging; but these men are greatly in the minority.

Q. It has been published that less than three ten-thousandths of one per cent (.0003%) of the 4,603,713 acres of merchantable forests of California suffered by fire during the dry season of 1913. Are these figures correct?

A. The figures are very misleading and incorrect. Taking the total area of merchantable forest in California as 12,786,306 acres, the report of the Federal Forest Service alone shows that 13,861 acres of timber land were burned over; this is slightly more than one tenth of one per cent (.108%) of the total. Adding to the Forest Service figures those of fires outside the national forests and reported by firewardens to the State Forester, the total area of timber land burned over in California during 1913 is 61,812 acres or approximately one half of one per cent (.48%) of the total area of merchantable forests.

Q. What money loss do these fires on timber land represent?

A. Applying very conservative figures the total money damage to timber alone during 1913 was $124,059.00. The value of cordwood destroyed is included in this amount.

Q. What was the total money loss occasioned by forest fires in 1913?

A. The total damage in California amounted to $511,077.00. (See Table No. 10, page 22.)

NOTE.—In a report issued by this office to the Forest Fire Conference of the Western Forestry and Conservation Association, by an error in editing, the total money damage occasioned by forest fires in California was said to be $508,984.50. This error is hereby corrected.

Q. Was any record kept of the number of men who fought fires in 1913?

A. Exclusive of the United States Forest Service a very incomplete record was made; 6,302 men assisted in fighting fires, representing a total of 2,905 hours' work. At 25 cents per hour this would amount to $726.25. This record represents but 157 fires while 343 fires were reported.

LESSONS FROM OTHER STATES.

From the following brief data bearing upon the activity in forestry taken by various states one fact is decidedly unquestionable. It is a fact that the progressive attempts to secure adequate and consistent forest legislation in California have not been prompted by necessity wrongly conceived nor are the principles involved based upon unwarranted assumptions. No master of industry would hesitate for a moment to spend $100,000.00 yearly if he knew that by investing that amount in a certain way he could prevent an annual loss of millions. Masters of industry are such by virtue of adhering to business principles. A state should consider herself a great master of industries. Realizing that thousands of commercial activities in our State depend directly or indirectly upon the forests, we can not read the following without recognizing a measure wherein California has unfortunately overlooked a very vital business principle.

Thirty-three states have recognized the importance of forestry and have made legislative enactments relative to forest protection and development. The tendency is to improve the stronger state laws and to strengthen the weaker ones by better legislation and increased appropriations.

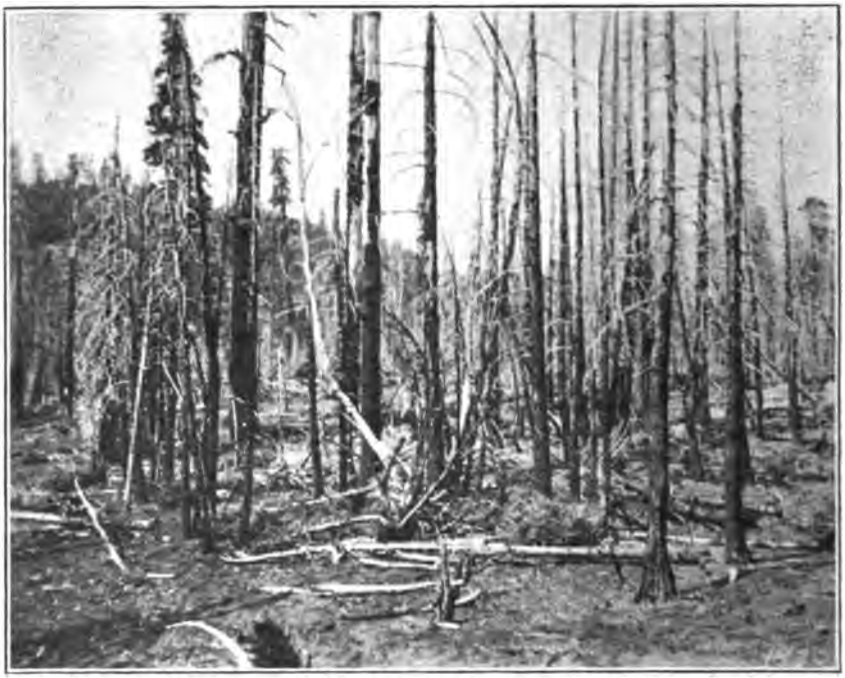
Massachusetts spends $295,000.00 annually for forest protection and extension. and solution of her forest problems, but her timbered area is only 2,000,000 acres. The legislature meets annually and appropriations are made annually. Provision is made for reimbursement to towns for forest fire equipment, and firewardens are paid out of the appropriation for forest fire work.

Pennsylvania, although having but 12,000,000 acres of forested area, spends annually $280,250.00 for the protection and administration of her forests. A biennial appropriation of $50,000.00 is made for extinguishing forest fires anywhere in the state. There is a labor appropriation providing $100,000.00 for two years to cover expenses of all kinds for labor connected with the state forest reserves by individuals other than foresters and rangers. A biennial appropriation of $50,000.00 is made for the purchase of lands.

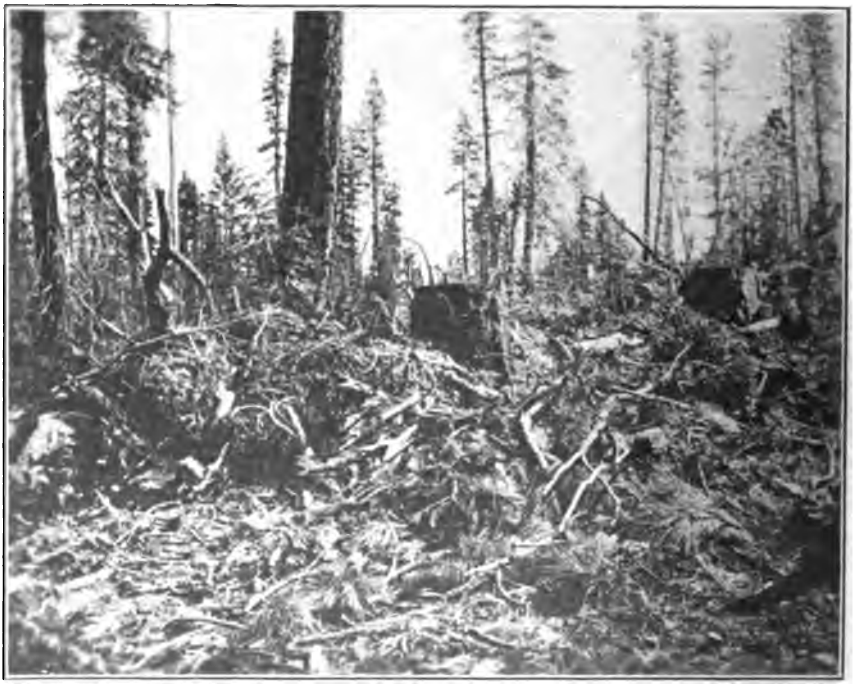
Wisconsin with her 16,000,000 acres of forested lands spends $137,100.00 annually. Of this amount $10,000.00 a year is for the purchase of forest reserve lands. A forest reserve fund consisting of the proceeds of all sales of scattering and agricultural lands, timber, etc., varies; but the income averages about $75,000.00 a year.

New York spends $266,800.00 on her forested area of 12,000,000 acres. Among the appropriations $50,000.00 is provided annually for fire protection.

Oregon, now realizing the great forest wealth entrusted to her care, is accomplishing much in progressive forest protection work. Sixteen protective associations are actively engaged in the prevention and suppression of forest fires. In 1911, twenty-three supervising firewardens were employed from June 1st to October 1st, at a salary of $100.00 per month and expenses.



Small pine trees killed by fire. This quite frequently happens when reproduction takes place on or adjacent to areas similar to—



this. Here the tops and limbs have been allowed to remain after logging and will be a constant menace to young trees in the future. As insurance against destruction of the future timber crop such material should be piled and burned

Second growth redwood and tanbark oak, 4 to 12 inches in diameter, in need of protection from fire. Lookout towers and fire trails are indispensable to a well organized fire system.

Firebreak in need of clearing; built for protection of homes and an important watershed.

Washington. A forest fire service is maintained during four months of the year—June, July, August and September—in twenty-three of the timbered counties of the state. At the beginning of the fire season, a firewarden is appointed in each county, and later in the season, when conditions demand greater supervision, others are appointed. The largest part of the appropriation under state firewarden and forest fire service is expended in paying and reimbursing firewardens and men employed in fighting forest fires.

Each warden receives compensation not to exceed $4.00 per day, and also necessary and proper expenses of all wardens, together with all expenses incurred in forest fire protection, are borne in the proportion of two thirds by the state and one third by the county in which the service was given and the expense incurred for forest fire protection.

California has a forested area of approximately 24,000,000 acres and spends only $21,900.00 annually. No part of this is for fire protection, and there is no appropriation made for compensating men for fighting fires. Our firewardens are all voluntary and appointed by the State Forester.

As is shown some states have made a good beginning and an adequate working capital has been provided. An effort has been made to keep the forestry departments as free from political influences as possible. Every phase of this great movement is new; the work is both investigative and creative, and its ultimate success depends largely upon the officer's familiarity with forest conditions in his state. The problems are as intricate as they are numerous. Much time is required to gain a thorough working knowledge of field conditions and of the problems affecting different interests and localities. Frequent changes in administration are detrimental to the solution of problems that oftentimes require years of patient study and observation.

The following comparative table gives a summary of the appropriations of the various states in which forestry work is being conducted. Special attention is called to the acreage of timbered land and the corresponding state appropriations:

Table No. 13. Comparative table of appropriations for state forestry work.

State	Annual forest appropriation					Total area, acres*	Forest area	
	Salary	Maintenance and general	Protection	Purchase of state forests	Total		Acres	Per cent of land area
Alabama		$500 00			$500 00	32,818,560	20,000,000	61
California	$6,400 00	15,500 00			21,900 00	99,898,880	24,000,000	24
Connecticut	6,500 00	1,500 00	$2,500 00	$1,000 00	11,500 00	3,084,800	1,250,000	38
Indiana	2,920 00	5,000 00			7,920 00	22,966,400	2,348,526	10
Kentucky		15,000 00			15,000 00	27,715,840	9,415,866	34
Louisiana	2,300 00	900 00	62,500 00		65,700 00	29,061,760	16,500,000	57
Maine	4,000 00	2,500 00	70,399 00		76,899 00	19,132,800	14,291,918	75
Maryland	4,500 00	5,000 00	3,500 00	29,500 00	42,500 00	6,362,240	2,000,000	31
Massachusetts	5,000 00	230,000 00	25,000 00		260,000 00	5,144,960	2,500,000	48
Michigan		50,000 00			50,000 00	36,787,200	15,500,000	42
Minnesota		75,000 00		[1]250,000 00	75,000 00	51,749,120	15,500,000	30
Montana	2,500 00				2,500 00	93,296,640	18,000,000	19
New York	37,100 00	10,000 00	119,000 00		166,100 00	30,498,560	12,000,000	39
North Carolina		3,000 00			3,000 00	31,193,600	19,600,000	63
Ohio		12,000 00			12,000 00	26,073,600	4,600,000	17
Oregon		37,000 00			37,000 00	61,188,480	28,500,000	47
Pennsylvania	8,500 00	223,250 00	25,000 00	25,000 00	281,750 00	28,692,480	9,200,000	32
Rhode Island	1,000 00	500 00	1,500 00		3,000 00	682,880	250,000	37
Vermont		10,000 00		7,500 00	17,500 00	5,839,360	2,500,000	43
Washington	2,000 00	500 00	35,500 00		38,000 00	42,803,200	20,000,000	47
Wisconsin	35,000 00	50,000 00	120,000 00	60,000 00	265,000 00	35,363,840	16,000,000	45

*Area, "Report of the National Conservation Commission," Vol. 2, page 346.

[1] For Certificate of Indebtedness—purchase of lands and timber. Not annually appropriated.

PROTECTIVE ASSOCIATIONS.

Perhaps there is no better form of private cooperation than that with associations of timberland owners. In states where provision has been made for fire protection the interests of private owners has been greatly increased, due to the practical assistance offered by the State in protecting the various private holdings and also adjacent areas in the possession of less careful owners.

The first fire protective association of private owners was organized in Idaho in 1906, and its effective work has stimulated a similar movement in most of the timbered states from the Atlantic to the Pacific coasts. In California five such associations have been organized. Each has its plan of organization and executive officers. Assessments are made at the will of the members and designed to meet costs incurred in the accomplishment of protective work deemed necessary. A supervisor, chief firewarden, or professional forester is employed by some associations; but marked results are being obtained also by associations where assessments are very small, and where, with suggestions from the State Forester, the members get together and do protective work, such as brush burning, proper clearing, and the construction of fire trails. As examples of what is being done in this way, the following reports from the few associations are conclusive:

Report from the Redwood Fire and Protective Association.

FORT BRAGG, CALIFORNIA, December 5, 1913.

State Forester, Sacramento, California.

DEAR SIR: It has been impossible for me to get all the data together regarding the work our Association carried out in 1913, until the present time, but I trust this will reach you in time to embody in your annual fire report.

Fire Trails.

We completed about 3½ miles of new trails, and burned and cleared out 9½ miles of other trails, besides reclearing and reburning 4 miles of very old trails. The total cost of this work was $504.49.

The trail building in the Ten-Mile River district is practically completed, and we figure next year to spend a certain amount of money in going over old trails made several years ago.

Patrol.

We put on two patrolmen in the month of June and kept them steadily employed until the latter part of October, when our first heavy rains came.

These men did very good work. They put out a number of very small fires, and warned settlers and campers to be careful with fire.

We feel that although our fire loss as to acreage burned over was much greater than in 1912, still if we had not had any patrolmen on, our acreage loss would have been much larger.

The patrol expense for the year was $498.00.

Fires.

Our 1913 fire loss as to acreage burned over was much greater than in 1912; in fact, it was the driest year we experienced for some time. As a general rule in the redwood belt we get rains along in September, but this year our rains did not come until the first part of November, and in consequence the country was so dry that a great many fires got away from settlers clearing land, also a few logging fires got away and burned over considerable acreage of green timber before they were controlled. Considering the number of acres burned over, we consider ourselves very lucky as to the small amount of actual damage done to the green timber, which was practically nothing.

Fires that burned over standing timber protected by this Association are summarized as follows:

Set by hunters on Wages Creek. This fire burned over considerable territory, but only burned over 160 acres of Association timber, as we fought this fire for over a week to keep it out of our territory. No damage to timber, or very little at the most.

Logging fire that got away and burned over about 2,000 acres on the Noyo watershed. The timber damage was very slight, as the fire burned very slowly and the country burned over was not heavily timbered. Put out by Association and logging crew men.

Fire got away from railroad right of way clearing and burned over about 80 acres of cut over land. No damage.

Fire got away from settlers clearing land and burned over about 40 acres standing timber; damage very slight. Put out by Association men.

Fire from hunters throwing away lighted tobacco, burned over about 25 acres of standing timber. Very little damage. Put out by logging crew.

Logging fire got away and burned over about 200 acres. No damage. Put out by logging crew. There were a great many small fires set out by settlers to clear land; some of these fires got away, but burned over mainly cut over land. The total cost of fighting fire by the Association amounted to $495.55.

Publicity.

We wrote, at different times, articles for our local county papers regarding forest fires; put up a great many fire warning signs; put slides on in moving pictures, showing what the community loss is from a forest fire, and we tried in other ways to educate the public to the need of being careful with fire when business or pleasure calls them into the woods.

A great many have applied for burning permits, and when such permits were given to settlers, they nearly always complied with the restrictions contained on each permit.

Our assessement for the year 1913 was 1½ cent per acre and our total expenditures for the year will amount to approximately $1,500.00.

Yours very truly,

REDWOOD FIRE AND PROTECTIVE ASSOCIATION,
R. D. Swales, Secretary.

Report from the Stockmen's Protective Association.

Livermore, California, November 24, 1913.

State Forester, Sacramento, California.

Dear Sir: Replying to your recent request for a statement of the range fire conditions in this district during the summer season which has just closed.

On July 7th, four hundred acres were burned over on the Mulqueeney and Ryan properties, and on August 7th, seven hundred acres more were burned on the same properties. Twenty men worked on the fires for an average of four hours each. These fires were caused by defective insulators becoming short-circuited and igniting the surrounding grass. The claimants collected, through the Stockmen's Protective Association, one thousand dollars in damages without resorting to the courts. This amount was paid by the Power Company.

A fire occurred July 21st in the Mount Vordman district, burning one hundred fifty acres. Five men in charge of Mr. Charles Scott, local county patrolman, extinguished the blaze. The fire was caused by careless hunters; proof being insufficient there was no prosecution.

A fire on the Banta range in Arroyo Mocho Creek on July 30th burned over thirty-five acres. Patrolman Scott with two men succeeded in controlling the fire. The cause believed to be careless hunters but no prosecution followed.

In all of these fires your local firewardens were in attendance. The alertness of the range owners has prevented fires, because the general public realizes the interest at stake.

Alameda County this year employed four fire patrolmen at $85.00 per month, for a period of five months; San Joaquin County employed one at $85.00 per month for the same period.

We believe that our organization has been the cause of the saving of many thousands of dollars to range owners, and thereby has been directly responsible for a benefit to the business public.

We appreciate the recognition which your office has given to our efforts, and we are willing to cooperate with you at all times in the future.

JOHN J. CALLAGHAN.
Secretary.

Report from the California Forest Protective Association.

San Francisco, California.

The report from the Secretary of the California Forest Protective Association reads in part as follows:

"For a report of the activities of this Association and what has been accomplished in the matter of prevention against forest fires, you are referred to page 32-D of the December number of the *Timberman* under the heading 'California.'

In addition to this, we have carried on an educational campaign for the purpose of arousing the people to their interests in protecting the forests from fire, details of which have already been mailed to you."

The account in the *Timberman* takes up in some detail the work being done by a few individuals who are members of the association. These members, as individuals, deserve public appreciation for the commendable protective work done on their private timber holdings.

Report of the Placer Forest and Home Protective Association.

Applegate, California, January 24, 1914.

State Forester, Sacramento, California.

Dear Sir: You ask, in your favor of January 21st, for particulars concerning the formation of our Association, its by-laws, object and aims.

We are very glad to answer this, because we believe that every community situated as we are, should, for its own protection, form an organization of kindred character. In fact, there is scarcely a county or district in the State whose furtherance of public needs would not be the better served thereby.

To make a comprehensive statement concerning the present Association, it will be necessary to explain the conditions which prevail here. This section of the State was settled early in the fifties. When the railroad cut its way through the mountains it passed directly through Applegate and for years drew upon the surrounding territory for wood, not only for ties, but for fuel for its engines. This demand, plus lumbering proper, cut off most of the virgin growth of timber, and since but little was known as to the necessity of caring for the waste at that time, vast quantities of refuse were allowed to remain, to work future havoc through forest fires which almost annually swept over the country. As the county became settled, the prospective farmer usually found traces of gold on his property and immediately abandoned the more profitable occupation for the lure of the precious metal.

For this reason the land lay practically dormant. Cattle interests came in and grazed their herds on the hills without regard to the ownership of property or to party lines and oftentimes it is stated that the cattle men themselves burned over vast tracts for the purpose of securing a better growth of stock feed for the following season.

This brought about the conditions that exist to-day and there is scarcely a section of land in the foothills which is not menaced more or less by the brush and fallen timber. No fire lines were cut and when a fire broke out it was nip and tuck whether it would sweep through the country or could be stopped at some narrow trail which had been cut to facilitate travel between given points.

The citizens of Applegate came at last to realize the necessity of organization, that it was much easier to fight fires in winter than in summer, and thereupon an association was formed, made up of residents whose principal duty would be the proper control of forest fires. It took shape late in the year 1913 and immediately proceeded to fit its members to make an effective campaign during the season of 1914.

One of our first actions, even before the organization was perfected, was to enlist the interest of the State Forester and at this time every member of our Association is deeply grateful for the quick and kindly consideration then extended by the State.

The by-laws were made simple but with sufficient scope so that the Association could broaden its sphere of influence, beyond the prime consideration of fire prevention and control, into other realms of civic usefulness constituting the "home protective" feature of our association title. The binding portion of our by-laws rests in an "agreement" which every member is requested to sign. This can be changed from year to year to meet the needs of the association, without amending the by-laws.

Considerable interest has been aroused and we are confident that the association will grow and, we trust, will reach out so as to include the entire county. We hope to cut adequate fire trails from river to river which will constitute an effectual barrier to the progress of fires coming from the north, south, east or west.

(Photo by Placer Forest and Home Protective Association.)
The headwaters of the Bear River. A typical view of a territory much in need of fire protection. Vast areas of this region were fire swept during the past season.

(Photo by Placer Forest and Home Protective Association.)
Typical foothill pasture land. Frequently a grass fire can be checked by back-firing from such a road as shown in the picture.

We hope also in the near future to take up the beautifying of our roads and school grounds, the planting of trees, and the removal and burning of all unsightly brush; in fact, to make the association serve as a local club, at the same time not losing sight of that most necessary thing, the control of fires; and to extend our work to all parts of the county, establishing like associations wherever the residents can be made to see the need of such.

Some of the illustrations which accompany this letter give a fair idea of the necessity of reformatory work, while others merely show the beauty of the district where the brush has been cleared out. So soon as the weather will permit, we shall forward one or two to illustrate the present encroachment of dead brush, fallen timber, and entangled undergrowth, indicating the crying need of reform. Our only regret is that we can not match these now with views taken three months later, so that we might show the same places cleared of the undergrowth and therefore outside of the danger zone. We are well aware that fire rarely spreads unless there is undergrowth, dead leaves, and a carpet of pine needles, to feed the flames.

Many counties in California are menaced like ours and to all such we would suggest the advisability of effective organization and cooperative effort akin to ours. We have already had one or two applications from other associations, formed or to be formed, in the State, and have not hesitated to furnish promptly a copy of our by-laws and our working agreement, coupled with pertinent suggestions and the recommendation that they, next in order, seek the cordial assistance of the State Forester and have the matter looked into carefully before perfecting their organization, as our experience with the State's able representative has proved invaluable. Again, the ultimate success of any organization is often largely due to its start under favorable auspices and its early work, on which account it is the part of wisdom to go right to headquarters for expert advice before taking any steps toward organization. We are ready and willing to answer any communications which come to us regarding our organization and its field of usefulness.

We hope to see the enthusiasm in work of this character spread and will gladly contribute to that end as far as possible.

Not every one seems to realize the need or magnitude of cooperative effort of this character, which makes for the protection of the watersheds and as California is a semi-arid State, water is wealth and must be conserved; and nature's method of conservation is vastly superior to any conceived by man. Where the trees and shrubs are allowed to remain and thrive, water will stay in the ground for months, keeping the springs alive, and they naturally feed the rivers; but where the country is desolated and all trees destroyed or allowed to die, the land soon washes, cuts into deep furrows, and all water drains off quickly, thereby creating a scarcity in the months when water is sorely needed.

The photographs submitted were made by one of our members and it is his intent to take others from time to time as the work progresses, and these will be sent to your office, so that you may be fully informed, not only by correspondence, but by illustration, of the work done here.

We take this occasion to thank you, and through you the State Board of Forestry, for your cordial support and encouragement; while we know that it is the duty of the Board and one purpose for which it was organized, still, the spirit with which the aid was given makes it doubly appreciative.

The following is a copy of the by-laws and agreement of our Association:

By-Laws of the Placer Forest and Home Protective Association.

ARTICLE I.

Section 1. The name of this organization shall be the PLACER FOREST AND HOME PROTECTIVE ASSOCIATION.

ARTICLE II.

Section 1. The object of this association is to prevent and suppress forest fires, occurring on or threatening property in or adjacent to the territory represented in the Association; also to further the purposes of a mutual agreement, dated at Applegate, November the 10th, 1913, signed by the members of this organization, for protecting this territory in the particulars stated therein.

ARTICLE III.

Section 1. All residents, and non-resident property owners, may become members by signing the roll of membership and paying the initiation fee.

ARTICLE IV.

Section 1. This Association shall meet regularly at Eureka District Schoolhouse, on the first Sunday of each month, at 10 a. m.

Section 2. Special meetings may be convened at the call of the president, or by the request of five or more members.

ARTICLE V.

Section 1. Seven members shall constitute a quorum.

Section 2. No proxies, except those of non-resident members, shall be recognized in the membership meetings, and a majority of members present shall decide any question that may come before the meeting.

ARTICLE VI.

Section 1. The officers of this Association shall be a president, vice-president, secretary, and treasurer, each of whom shall hold office from November 17, 1913, until the 17th day of November, 1914, at which time an annual election of officers shall be held.

Section 2. All officers shall hold office until successors have been elected.

ARTICLE VII.

Section 1. It shall be the duty of the president to preside at each meeting, prescribe rules of procedure, appoint an executive committee (which shall be confirmed by a majority vote of a quorum) and all necessary committees and temporary officers, unless otherwise provided for in these by-laws. He may appoint committees of investigation at any time that the occasion demands such appointment.

Section 2. It shall be the duty of the vice-president to preside in the absence of the president.

Section 3. The president shall be ex officio member of all committees.

Section 4. It shall be the duty of the secretary to keep the minutes of each meeting, to receive and forward correspondence of this Association, and to give due notice of the time and place of meetings to all members.

Section 5. It shall be the duty of the treasurer to receive and receipt for all incomes and funds of this Association. He shall retain such funds, subject to the order of the president, and shall make a report of all incomes and disbursements at each regular meeting.

Section 6. The treasurer shall cash no warrants unless the same be duly signed by the president.

ARTICLE VIII.

Section 1. The executive committee shall consist of five members, who shall duly investigate all grievances of members, make any and all suspensions of officers or members, receive the reports of the committees of investigation, and make recomdation on the same to this Association.

ARTICLE IX.

Section 1. In the absence of the president and vice-president, the chairman of the executive committee shall preside; otherwise, a majority of the members shall choose a temporary presiding officer.

ARTICLE X.

Section 1. The by-laws of this Association may be amended by a two-thirds vote of the members present at the meeting following the meeting at which the amendment was proposed.

ARTICLE XI.

Fees and dues; adopted. An initiation fee of one dollar (and yearly dues of one dollar after the first year) shall be paid by each member.

AGREEMENT.

We, the undersigned, members of the PLACER FOREST AND HOME PROTECTIVE ASSOCIATION, recognizing the danger from forest fires, which annually threaten our timber, pastures and homes, do hereby agree:

First—To give the necessary time or money to cut adequate fire trails in the several directions recommended by the State Forester and endorsed by the Association;

Second—To clear out and burn brush and refuse on the property of the various members, wherever same is a menace to the property of the member or adjacent property;

Third—To respond promptly on call of the State Firewarden for fire duty;

Fourth—To contribute pro rata, in proportion to the amount of land owned, leased or controlled by each of us, the funds required to prosecute any person or persons caught violating the state forest laws, provided that the committee of investigation have made a full and complete report on same and that the Association, in regular meeting, shall have endorsed the action.

This agreement shall be binding for one year from the date of our annual election, to wit, November 17, 1913.

--------------------------------(sign here)

Dated November 10, 1913.

Very truly yours,

W. D. READ, Secretary.

The Tamalpais Fire Association.

The Tamalpais Fire Association has in view work of similar character. Although it is still in the formative stage, it has secured the able services of a trained and experienced forester, under whose direction excellent protective work will undoubtedly be accomplished. At its inception the State Forester was called upon for suggestions and assistance in outlining a plan of activity, whereupon, under his direction, a working plan and map was prepared and submitted to the executive committee.

The following are extracts from communications received at the state office:

August 29, 1913.

State Forester, Sacramento, California.

DEAR SIR: At a meeting of the Executive Committee of the Tamalpais Fire Association held last evening, communications from you were read, and your map, showing suggestions for firebreaks to be constructed on Mount Tamalpais and in that vicinity, were presented and examined by the committee. The committee unanimously expressed its gratification at the receipt of the map, and that it will be useful and valuable to the Association. Your plans have been referred at once to the forester of the Association for his consideration. We thank you very much for the excellent work you have done.

Very truly yours,

E. J. MOTT, Secretary.

September 24, 1913.

State Forester, Sacramento, California.

DEAR SIR: The Association wishes me to thank you for your report on fire protection for Marin County, and to assure you that it much appreciates the cooperation you have given it.

Very truly yours,

F. E. OLMSTED,
Forester, Tamalpais Fire Association.

Associations organized in the several states for the prevention and suppression of forest fires are given in the following table:

Table No. 14. Showing protective associations in several states.

State	Designation	Secretary or Forester
California	Redwood Fire and Protective Association.	R. D. Swales, Secretary, Fort Bragg, Cal.
California	Stockmen's Protective Association.	J. J. Callaghan, Secretary, Livermore, Cal.
California	Tamalpais Fire Association	F. E. Olmsted, Forester, San Francisco, Cal.
California	Placer Forest and Home Protective Association.	W. D. Read, Secretary, Applegate, Cal.
California	California Forest Protective Association.	George H. Rhodes, Secretary, San Francisco, Cal.
Idaho	Clearwater Timber Protective Association.	Ben E. Bush, Secretary, Orofino, Idaho.
Idaho	Coeur d'Alene Timber Protective Association.	F. J. Davis, Secretary, Coeur d'Alene, Idaho.
Idaho	Pend d'Oreille Timber Protective Association.	T. J. Humbird, Secretary, Sandpoint, Idaho.
Idaho	Potlatch Timber Protective Association.	W. D. Humiston, Secretary, Potlatch, Idaho.
Maine	Kennebec Valley Protective Association.	Forrest H. Colby, Secretary, Skowhegan, Me.
Michigan	Michigan Hardwood Manufacturers' Association Fire Protective Department.	J. C. Knox, Secretary, Cadillac, Mich.
Michigan	Northern Forest Protective Association.	Thos. B. Wyman, Secretary, Munising, Mich.
Montana	Northern Montana Forestry Association.	A. E. Boorman, Secretary, Kalispell, Mont.
New Hampshire	New Hampshire Timberland Owners Protective Association.	F. H. Billard, Forester, Berlin, N. H.
Oregon	Blue River Fire Patrol Association.	L. E. Bean, Secretary, Eugene, Ore.
Oregon	Baker County Fire Patrol Association.	Walter Palmer, Secretary, Baker, Ore.
Oregon	Clackamas-Marion Counties Fire Patrol Association.	C. S. Chapman, Secretary, Portland, Ore.
Oregon	Clatsop County Fire Patrol Association.	C. S. Chapman, Secretary, Portland, Ore.
Oregon	Columbia County Fire Patrol Association.	E. B. Faulkner, Secretary, Portland, Ore.
Oregon	Coos County Fire Patrol Association.	W. J. Conrad, Secretary, Marshfield, Ore.
Oregon	Deschutes Valley Fire Patrol Association.	J. P. Keyes, Secretary. Bend, Ore.
Oregon	Douglas County Fire Patrol Association.	R. E. Smith, Secretary, Roseburg, Ore.
Oregon	Jackson County Fire Patrol Association.	E. A. Hildreth, Sr., Secretary, Butte Falls, Ore.
Oregon	Josephine County Fire Patrol Association.	C. A. Sidler, Secretary, Grants Pass, Ore.
Oregon	Klamath-Lake Counties Fire Patrol Association.	J. F. Kimball, Secretary, Klamath Falls, Ore.
Oregon	Lincoln County Fire Patrol Association.	W. E. Ball, Secretary, Toledo, Ore.
Oregon	Linn County Fire Patrol Association.	C. S. Chapman, Secretary, Portland, Ore.
Oregon	Polk County Fire Patrol Association.	W. V. Fuller, Secretary, Dallas, Ore.
Oregon	Union-Wallowa Counties Fire Patrol Association.	A. J. Stange, Secretary, Le Grande, Ore.

Table No. 14—Continued.

State	Designation	Secretary or Forester
Oregon	Western Lane County Fire Patrol Association.	C. S. Chapman, Secretary, Portland, Ore.
Oregon	Oregon Forest Fire Association (clearing house of the associations in Oregon).	C. S. Chapman, Secretary and Manager, Portland, Ore.
Pennsylvania	Pocono Protective Fire Association.	W. R. Fisher, Secretary, Swiftwater, Pa.
Pennsylvania	Central Pennsylvania Forest Fire Protective Association.	J. M. Hoffman, Forester, Johnstown, Pa.
Washington	Washington Forest Fire Association.	M. R. Hunt, Secretary, Seattle, Wash.
Northwestern States	Western Forestry and Conservation Association. (Clearing house of the associations in California, Oregon, Washington, Idaho and Montana.)	E. T. Allen, Forester, Portland, Ore.

ASSISTANCE FROM THE FEDERAL GOVERNMENT.

The Weeks Law.

The Weeks law, enacted in March, 1911, by the Sixty-first Congress, provided an appropriation of $200,000.00 with which the Secretary of Agriculture was authorized to cooperate with the states in protecting the forested watersheds of navigable streams from fire. In connection with the influence of forests upon the regularity of stream flow, Forest Service Circular 205, entitled "Forest Fire Protection Under the Weeks Law in Cooperation With States," says: "Fire destroys also the soil covering; this causes rapid run-off on steep slopes, and erosion results. The soil thus washed out is the chief source of sediment in the course of navigable streams. Forest fires, therefore, cause irregularity of stream flow and loss of navigability. This calls for active assistance from the Federal Government. Section 2 of the Weeks law is designed to authorize this assistance.

"*The Weeks Law*—Section 2: The purpose of section 2 of the Weeks law is to protect navigable streams, through promoting forest protection by the state and by private owners. The law requires that (1) the protection must be confined to the forested watersheds of navigable streams; (2) the state must have provided by law for a system of forest fire protection; (3) the Federal expenditure in any state must not exceed in any Federal fiscal year the amount appropriated by the state for the same purpose.

"*Administration of the Law.* The law is administered by the Forest Service under an agreement between the Secretary of Agriculture and the state. In the administration of this act, the Forest Service places a broad interpretation on what constitutes a navigable stream, with the exception that streams used only for floating logs, canoes, or rowboats will not be considered navigable. As a general basis of decisions on the question of navigability the reports of the Chief of Engineers, U. S. Army, are used."

Voluntary fire fighters in the process of corralling a fire near Ben Lomond, Santa Cruz County. The absence of existing trails and roads renders the task more difficult.

Ranchers in the Santa Cruz Mountains proceeding to a fire in response to a call for assistance.

The damage caused by grass or range fires is not confined to the destruction of forage alone; this shows how fences are demolished. Two lives were lost by such a fire last summer, and similar occurrences can be expected until a state fire protection system is installed.

A typical logged-off and unprotected redwood area. This area once contained timber similar to that shown on page 65. The buildings in the foreground are a portion of an abandoned sawmill camp.

"No state will receive more than $10,000.00 in any one year. Nor should it be assumed that the Federal Government will duplicate within the limit any appropriation made by a state for fire protection. It is proposed to disperse the Federal Fund as widely as possible, and throughout three years, in order that the educational value of the work may be fully realized. A fund of about $20,000.00 has been reserved to increase allotments to states where an emergency, due to unusual drought, may occur. The Forest Service takes the ground that before a region shall receive Federal aid the private owners must make a reasonable effort themselves. This requirement is most satisfactorily met by protective associations of timber land owners."

The following is quoted from the Report of the Forester, Washington, D. C., 1913, pp. 47-49:

"The original appropriation for this work, carried by the act of March, 1911, was $200,000.00. Of this, $93,464.65 remained unexpended on July 1, 1913. This balance was made available by the last Congress until June 30th, 1915, and supplemented by a further appropriation of $75,000.00 for the fiscal year 1914. Under the policy of restricting the annual expenditure in any state to $10,000.00 and encouraging fire protection in as many different states as possible, the total yearly cost of this cooperation will not exceed $100,000.00. Approximately $85,000.00 will be allotted to the cooperating states at the beginning of the fire season. A contingent of $15,000.00 will be retained to assist states in emergency which requires special measures and expenditures beyond those provided for in the plan of cooperation.

"The following table shows the allotments and expenditures by states:

Table No. 15.

State	Allotment, calendar year 1913	Expenditures, fiscal year 1913	Expenditures, March 1, 1911, to July 1, 1913
Maine	$10,000 00	$10,146 67	$20,394 47
New Hampshire	8,000 00	9,729 00	16,909 40
Vermont	1,500 00	1,797 25	3,676 40
Massachusetts	2,500 00	2,552 00	3,742 00
Connecticut	1,500 00	846 75	1,353 25
New York	8,000 00	4,490 00	7,636 00
New Jersey	2,000 00	1,953 83	3,108 33
Maryland	2,000 00	1,076 50	1,486 50
Kentucky[1]	4,000 00	----------	----------
Wisconsin	5,000 00	4,644 50	9,733 25
Minnesota	10,000 00	7,990 75	24,076 25
Montana	3,500 00	27 50	27 50
Idaho	7,000 00	1,159 20	1,159 20
Washington	10,000 00	2,818 75	2,818 75
Oregon	10,000 00	7,414 50	10,414 05
Totals	$85,000 00	$56,647 20	$106,535 35

[1] No expenditures until fall of 1913.

"During the year the cooperative field organization was extended to Idaho and Montana, on portions of the watersheds of the Snake and Missouri rivers. An additional cooperative agreement, with the State of Kentucky, has been practically completed; and agreements with the states of West Virginia and South Dakota are under consideration. Under the agreements in force a skeleton corps of 250 Federal patrolmen is maintained, which is increased as the fire hazard may require. This force guards an area of approximately ten million acres, for the most part mountainous and inaccessible, located on important watersheds and containing portions of the most valuable timber in the country. The patrolmen have maintained a high standard of efficiency, extinguishing hundreds of small fires and warning thousands of sportsmen, tourists, loggers, and others who frequent the woods against carelessness in the use of fire. The original appropriation has been used conservatively, and its expenditure extended over nearly four years. The fund has been distributed among as many different states as can meet the requirements of the law. The expenditures of the State must in every instance equal those of the Federal Government, and in most cases the State expends several times the allotment received. Active cooperation on the part of private timber land owners and railroads has been encouraged by every possible means, and the amount of assistance from these sources is steadily increasing. All told, it is roughly estimated that for every dollar expended by the Federal Government for fire protection under the Weeks law, from three to five dollars have been expended by the states, together with private individuals and corporations."

"The Federal expenditures are limited almost exclusively to the salaries of forest patrolmen and watchmen at mountain lookouts. These men are paid directly by the Government; no Federal funds are dispersed by the state. The educational value of this cooperation has been shown by the impetus given by the enactment of legislation which would enable states to meet requirements of the act. Since the passage of the law, Massachusetts, Connecticut, West Virginia Kentucky and Wisconsin have enacted legislation of this character; and bills making similar provisions have been introduced into the legislatures of North Carolina, Tennessee, Ohio and California. An advantage to the State of no slight importance is the service rendered by the Federal Government as a clearing house for ideas on effective methods of state organization and fire control. A meeting of state foresters, under the auspices of the Forest Service, was held in January, 1913, and much was accomplished towards standardizing fire protective organizations, equipment, fire breaks, lookouts, and aids in the protective work in the respective states. In the inspection of field work a further opportunity is afforded Federal officers to suggest improvements and carry good ideas developed in one state to other states. Cooperation in the protection of forested watersheds was initiated by the Weeks law as one means of assisting states in safeguarding the navigability of important rivers. At its inception this work was an experiment. The results of two and one half years in actual protection and in educational benefits are conclusive as to its success. The function which the Forest Service is thus discharging bears a direct and important relation, not only to the preservation of navigability on important streams, but also to the whole problem of flood control. More than that, it is vitally related to the whole development of state forestry and fire protection and enables the Forest Service to assist effectively in the splendid progress along these lines now being made in many states. Important assistance in shaping forest policy and drafting local legislation was extended upon request to New Hampshire, Rhode Island, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Missouri, Tennessee, Ohio, Michigan, Nebraska, California and Porto Rico."

In California there are but two rivers which would be classed as navigable streams under the provisions of the Weeks law. These rivers, the Sacramento and San Joaquin, drain the two great valleys of the State, and extend, with their numerous tributaries, far into the Sierra Nevada and Coast Range mountains. Consequently, the law will apply to the protection of the greater part of California excepting the western slopes of the coast ranges and other watersheds of streams not tributary to either the Sacramento or San Joaquin rivers.

Present Federal Control.

There is now in existence an effective framework of forest protection; and with adequate state appropriation enabling the State to take a more active part in field work this will rapidly develop into a strong and effective cooperation of Federal and State forces. The Federal forest rangers, numbering in California about 250, serve as voluntary firewardens for the State. Although the rangers are restricted in their territory to areas within their respective forests, they have given much assistance in preventing the spread of fires originating on reserve land. The National Forests are patrolled and a few lookout stations have been built; telephone lines are being extended and the forests rendered more accessible as rapidly as funds will permit.

During the summer of 1912 the U. S. Post Office Department made provision for lending its support to state officers in the prevention of forest fires. The following order indicates the manner in which the department stands ready to help:

ORDER No. 6316.

"*To the Postmaster.*

SIR: The following instructions are promulgated for the guidance of the postal employees concerned:

In accordance with the request of the Secretary of Agriculture, this Department has arranged a plan of cooperation with State and National Forest officers whereby rural and star route carriers shall report forest fires discovered by them along their routes to persons designated by the State and National authorities to receive such intelligence.

The State and National authorities will inform postmasters as to whom the discovery of fires shall be reported, and each rural carrier should be directed to cooperate to the fullest extent with such authorities in the manner agreed upon, namely, that the carrier shall report a fire to the nearest state firewarden or National Forest officer on his route, or if no such officer or warden lives on the route, to arrange through some responsible citizen to have him notified, by telephone, if possible. Star route contractors and carriers are included in the plan of cooperation and should be requested to report the discovery of fires in the same manner as will be done by the rural carriers.

Postmasters in or near National Forests are also directed to report fires to the nearest Forest officer.

Respectfully,

P. V. DEGRAW,
Fourth Assistant Postmaster General."

Rural and star carriers traverse hundreds of miles of country, in the State, that is subject to fires. Assistance such as is offered in this way will be extremely valuable to district fire rangers and will entail no expense to the State. However, not until California makes provision for a corps of paid district rangers will we be in a position to fully realize the advantage to be gained from such generous Federal cooperation. Many thousands of acres outside the National Forests are visible from Federal lookout stations, and the sentinels will gladly inform state patrolmen of fires originating on such areas. By supplementing the present tower system with a few judiciously located stations, remote from the National Forests, the whole area in need of protection will be surveyed daily by alert "lookouts."

LEGISLATION.

The first public expression of the need of a definite forest policy was the passage of an act in March, 1885 (page 70, Appendix), establishing a State Board of Forestry. At first the Board acted in the capacity of a Commission of Inquiry with emphasized educational functions. By an amendment police powers were conferred in 1887 (page 71, Appendix), for the purpose of making arrests for any violation of any law applying to forest and brush land within the State or prohibiting the destruction thereof, with an appropriation of $30,000.00 for the following two years. Two experimental stations were maintained, and the Board published three valuable reports on the forest conditions and the forest trees of the State. Little could be done in efficient protective work, and, suffering at the hands of reckless politicians, the act was repealed in 1893. Possession and supervision of the experimental stations passed over to the State University and the Board of Forestry was abolished.

Previous to 1905 California spent several thousand dollars in cooperation with the Federal Government with the purpose of obtaining a suitable forestry bill. The bill as introduced (page 71, Appendix), had the approval of the Federal Forest Administration. A study was made of the State preparatory to launching such a forest policy. However, those in control of the legislature at that time were determined that such a policy, though needful and just, should be postponed as long as possible. The bill provided for five paid district firewardens, who should devote their entire time to the prevention and suppression of forest fires; the bill further provided for the compensation of men called upon to fight fires; and for paid fire patrol during the danger season. With these and other necessary measures the bill was a strong one against which no logical objection could present itself. The bill was passed and the Board of Forestry again created; but, not before destructive amendments had eliminated its vital provisions. The bill as passed (page 77, Appendix) gave the State Forester no greater working force than the voluntary firewardens. No compensation could be made to firewardens and assistants for fighting fires, regardless of the seriousness of the situation, and, with several important measures denied, the Board was forced to face a serious and difficult problem with practically no provision for meeting the inevitable requirements for success.

As a result of the unwise elimination of the essential provisions of the forestry bill, our forests and ranges have continued to be devastated.

The attitude of many who controlled the legislature may be interpreted as favorable to forestry and protection just so long as nothing would be affected by its principles. In other words, have a State Board of Forestry to satisfy the public sentiment demanding such a body but see to it that the Board be kept powerless to accomplish what public sentiment, when more closely analysed, desires, namely, effective work. The aim has been to prevent the forestry board from gaining such ground as would enable it to suggest that timber owners adopt precautions similar to those employed on State and Federal land and not unlike those compelled in cities.

Unlogged redwood forest. When the present crop is removed another of equal value can be grown if the cut-over area is protected from fire.

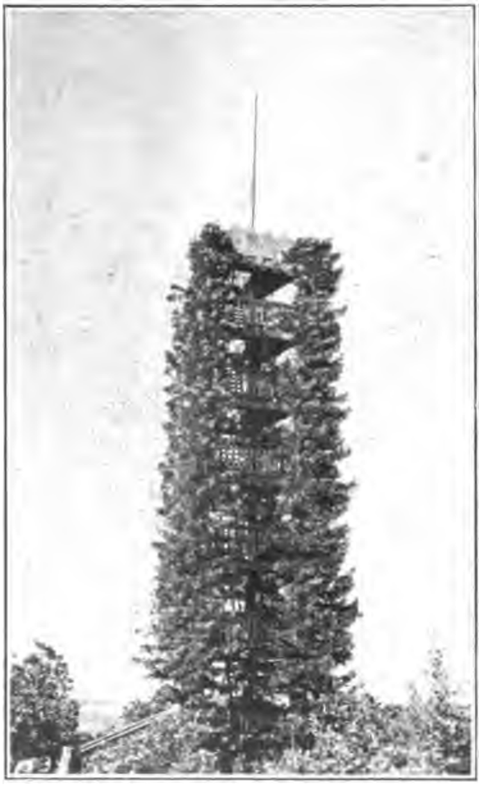
Voluntary fire fighters preparing a meal after working thirty hours without food or sleep. The cooking utensils in sight served for eighteen men for a period of nine days.

The state forestry bill as introduced in 1913 (page 91, Appendix) made necessary provisions similar to those left out of the 1905 bill. Certain opposition declared, with misleading arguments, that the measures were drastic and radical. The bill made no provision for work not already in useful operation in states truly interested. The bill was based primarily on the actual need of adequate forest protection in California and the need as evidenced by the expenditure of thousands of dollars in cooperation with the Federal Government for that purpose. Opposition has failed to meet this need with any better provisions.

The supposed purpose of one factor of opposition is published as "the protection of the forests of the State of California and providing facilities for cooperation to that end by the forest owners, State of California, and the government of the United States."

Legislation is not radical when it seeks to provide for the following necessary measures:

1. The creation and maintenance of a state board of forestry.
2. The appointment of a state forester who shall be a technically trained man and fully capable of performing the duties logically placed at his hand.



From the fire towers the "lookouts" are able to discover and report a fire while in its incipiency. The State maintains no towers because no appropriations have been made for fire prevention and control.

Cut-over redwood lands inadequately protected from fire.

3. The appropriation of a fire protection fund to be used by the State Forester, with the approval of the board, in prevention and suppression of forest and range fires.
4. The possible financial cooperation between State, Federal, private and county agencies.

During the 1913 session two forestry bills were before the legislature; one contemplating handling the fire situation through voluntary associations, a plan, when carefully considered, inadequate and weak; the other, pursuing a method similar to those adopted by several states, included the provisions as stated above. It had in view a paid system of firewardens, an organization to supervise expenditures and a more efficient plan of fire patrol which is essential in reducing forest devastation to a minimum.

Neither bill became law. Included in the budget an amount of $50,000.00 was granted for the purpose of fire protection; however, the defeat of the bill providing for its expenditure rendered this amount inaccessible.

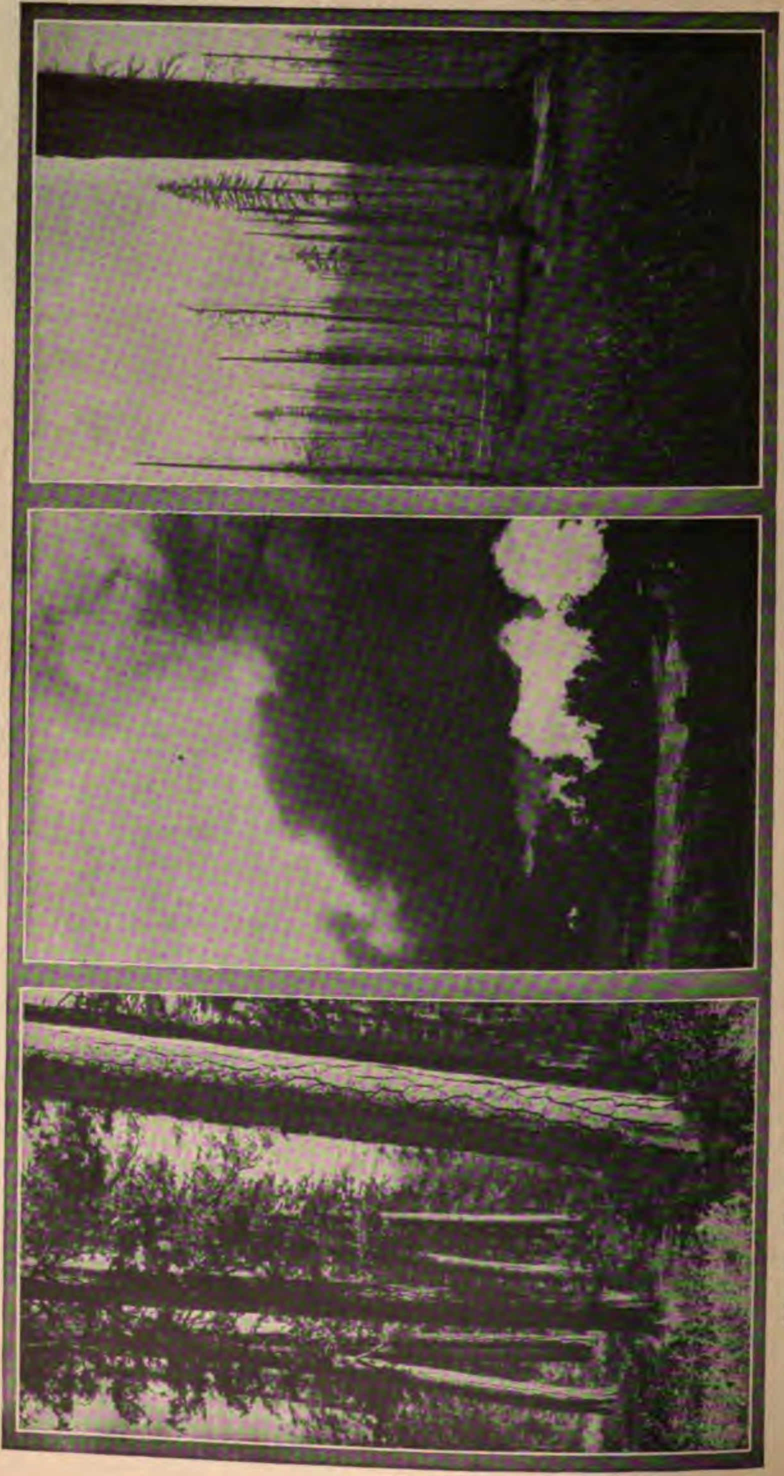
It is fair to assume that the defeat of this forestry bill did not voice a representative number of citizens, and further, that with a clearer vision of the problem before us we will support and pass a similar measure during the next legislative session.

In behalf of the public it is necessary to correct statements published from time to time by those opposed to state forest protection. It has been suggested that a forestry bill such as should be passed will impose pecuniary burdens and restrictions in the enjoyment and use of timber land. This is possible only where the individual thus burdened is intent upon practicing methods detrimental to public welfare. It costs money to accomplish anything worth while, and it will cost money to protect our forests. The problem has largely been worked out for us by other states.

Maine levies a special tax on timber districts, and the territory represented enjoys benefits without number from well organized forest protection. Pennsylvania has an admirable provision requiring railroads to minimize the danger of fire along their roads in wooded sections of the State. These are not considered as burdens; on the other hand, the railroads, lumbermen and settlers of timbered districts are recognizing the wisdom and farsightedness of such policies and are willing to cooperate, for by so doing they protect themselves. Since opposition has been brought to bear upon this subject, and unfounded arguments have been published as vitally opposed to bills introduced by the State Board of Forestry it is quite just to assume that the privilege of published analysis now rests with the State.

Opposition holds that the forestry bill with its necessary provisions was radical, that the State Forester, without any control by the State Board of Forestry or any other supervising agency, would have had complete authority over the expenditures of the moneys appropriated for forest protection, and also, to a great extent, would have been able to interfere with the management and control of privately owned timber lands. As an objection it is published that the State Forester would have been given authority to divide the State into districts as he saw fit; to employ such firewardens as he deemed necessary and fix their compensation; to remove them at his pleasure; to purchase equipment, instruments and supplies; to establish lookout stations, telephone and other systems of communication; and to equip supply depots, etc. In addition to the above powers, he could have cleaned up a forest area or extinguished a fire and put a lien on the land for the expense. All this, as opposition, is poorly chosen:

1. Because the State Forester would be at all times subject to the approval of the State Board of Forestry. This Board would and already does consist of the Governor, Secretary of State, the Attorney General and the State Forester. Still, and directly governing all



Forests—Protection + Fire =Devastation.

expenditures made by the State Forester, the State Board of Control is a powerful regulating agency. Consequently, it is evident that that point of the opposition to state forest protection is wrongly conceived and hereby declared misleading.

2. Because the bill provides that the State Forester shall be a technically trained man, and this insures the appointment of an official fully capable of carrying out the detail provisions of the bill.

In Oregon an act has been passed to require owners of timber lands to provide fire patrol during the season of the year when there is danger of forest fires. (Page 93, Appendix.)

In case any owner or owners shall fail or neglect to provide such fire patrol, then the State Forester, under direction of the State Board of Forestry, shall provide the patrol at a cost not to exceed five cents per acre per year and the amount collected from the owner or a lien placed upon the property. No bill in the California legislature has endeavored to make such a provision. This is referred to since it is an indication of what is being done along that line of the opposition in Oregon. The plan is receiving the support of the influential lumbermen as evidenced by a letter from the State Forester in which he says, "Our compulsory fire patrol law has the hearty support of practically all progressive timberland owners in the State. These owners have in the past voluntarily organized associations, and since the patrol law has resulted in making all timberland owners contribute toward the cost of the work, rates of assessment have in general been somewhat decreased."

APPENDIX.

An act to create a state board of forestry, and to provide for the expenses thereof.

(Approved March 3, 1885.)

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. There shall be established a state board of forestry, consisting of three persons, appointed by the Governor of the State.

SEC. 2. Each member shall hold office for the term of four years, and until his successor shall be qualified.

SEC. 3. The board may appoint and prescribe the duties of its secretary, and elect one of its members treasurer, both to hold office at the pleasure of the board.

SEC. 4. The duty of the board shall be to collect statistics and other information with regard to forestry, tree culture, and tree preservation, throughout the State; to correspond with various forestry societies and individuals, for the purpose of obtaining such information; to learn by investigation and experiments the adaptability of various trees to the different sections of the State; to disseminate such information throughout the State in such a manner as to aid and encourage the purpose for which this board is formed; to assist in enforcing and carrying out all national and state forestry laws, as far as practicable; to act with a special view to the continuance of water sources that may be affected in any measure by the destruction of forests near such sources; to do any and all things within their power to encourage the preservation and planting of forests, and the consequent maintenance of the water sources of the State.

SEC. 5. This board shall report biennially to the Governor a detailed statement of its work, which shall include all disbursements that may have been made. All printing required to be done by the board for their official use shall be done by the Superintendent of State Printing.

SEC. 6. There is hereby appropriated for the use of this board, out of any moneys in the state treasury not otherwise appropriated, the sum of five thousand (5,000) dollars for the two years beginning the first of April, eighteen hundred and eighty-five; said sum to be used for the payment of the salary of the secretary, not to exceed the sum of one hundred and twenty-five dollars per month, the necessary traveling expenses of the members of this board, the employment of assistants, and such other needful expenditures as this board may incur, and the State Controller will draw his warrants on the State Treasurer in favor of the treasurer of the board for the same.

SEC. 7. The members of this board shall receive no compensation.

SEC. 8. All acts or parts of acts in conflict with this act are hereby repealed.

An act to enlarge the powers of the State Board of Forestry and to provide for the expenses of said board.

(Approved March 7, 1887.)

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. All the members of the State Board of Forestry of this State, and all assistants now employed or hereafter to be employed by said board, are hereby endowed with all the powers of peace officers, for the purpose of making arrests for any violation of any law applying to forests or brush land within this State, or prohibiting the destruction thereof.

SEC. 2. There is hereby appropriated for the use of this board out of the moneys in the state treasury not otherwise appropriated, the sum of twenty-nine thousand five hundred dollars ($29,500), for the two years beginning the first of April, 1887; said sum to be used for the payment of the salaries of the assistants of said board, the necessary traveling expenses of the members of said board, and such other needful expenditures as said board may find necessary, and the State Controller shall draw his warrant on the State Treasurer in favor of the treasurer of the board for the same.

SEC. 3. This act shall take effect and be in force from and after its passage.

(Introduced in the Senate January 31, 1905.)

An act to provide for the regulation of fires on, and the protection and management of, public and private forest lands within the State of California, creating a state board of forestry and certain officers subordinate to said board, prescribing the duties of such officers, creating a forestry fund, making an appropriation for the purposes of this act, and defining and providing for the punishment of certain offenses for violations of the provisions of this act.

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. *State Board of Forestry.*—There shall be a state board of forestry, consisting of the Governor, Secretary of State, Attorney General and State Forester, which shall supervise all matters of state forest policy and management and convene upon the call of the Governor or of its secretary.

SEC. 2. *State Forester and his Duties*—There shall be a state forester, who shall be a civil executive officer, and who shall be a technically trained forester, appointed by the Governor, to hold office at the pleasure of the appointing power; and whether any candidate for the position is a technically trained forester shall be determined by certificate from the secretary of the United States Department of Agriculture. He shall receive a salary of twenty-five hundred dollars per annum; and shall be authorized and empowered to appoint a clerk, whose salary shall not exceed twelve hundred dollars per annum. He shall maintain an office in San Francisco at an expense not to exceed fifty dollars per month for rent, heat, light and incidentals; be paid reasonable traveling and field expenses, which may be incurred in the necessary performance of his official duties; and act as secretary of the State Board of Forestry. He shall, under the supervision of the State Board of Forestry, execute all matters pertaining to forestry within the jurisdiction of the State; have charge of all the firewardens in the State, and direct and aid them in their duties; direct the protection and improvement of state parks and forests; collect data relative to forest destruction and conditions; take such action as is authorized by law to prevent and extinguish forest, brush and grass fires; enforce all laws pertaining to forest or brush-covered land, and prosecute for any violation of such laws; cooperate with land owners as described in section 4 of this act; and publish from time to time such information of forestry as he may deem wise. He shall prepare annually a report to the Governor on the progress and condition of state forest work, and recommend therein plans for improving the state system of forest protection, management and replacement.

SEC. 3. *Supervision and Care of State Parks.*—The California Redwood Park, the Mount Hamilton tract, the Santa Monica forest station, the Chico forest station, together with all moneys heretofore or hereafter appropriated for the purchase of land for or care of said parks, tracts and stations, shall be in charge of the State Board of Forestry, said board to take the place of and forthwith shall have all the powers and duties now possessed in accordance with law by persons or commissions with regard to the state parks, tracts of land, and forest stations mentioned in this act, and also any forest or brush land which may hereafter become state property, or be placed definitely in the care of the State; and it is hereby further enacted that, if the Government of the United States or any individual or corporation shall, at any time, donate or entrust to the State of California, for state park or state forest reserve purposes, any tract or tracts of wholly or partially wooded land, such tract or tracts of land shall be administered at the expense of the State, as provided by law.

SEC. 4. *Cooperative Work.*—The State Forester shall, upon request and whenever he deems it essential to the best interests of the people and the State, cooperate with counties, towns, corporations and individuals in preparing plans for the protection, management and replacement of trees, woodlots and timber tracts, on consideration and under an agreement that the parties obtaining such assistance pay at least the field expenses of the men employed in preparing said plans.

SEC. 5. *Publication of Laws and Notices.*—The State Forester shall prepare and print for public distribution, an abstract of all the forest laws of California, together with such rules and regulations in accord therewith as he may deem necessary, and shall annually print and distribute a list of all firewardens with their addresses, all such matter to be published with the approval of the State Board of Forestry. He shall also furnish notices, printed in large letters on cloth, calling attention to the danger from forest fires and to forest fire and trespass laws and their penalties. Such notices shall be posted by the firewardens in conspicuous places along every highway in brush and forest-covered country, at frequent intervals along streams and lakes frequented by tourists, hunters or fishermen, at established camping sites and in every post office in the forested region.

SEC. 6. *District Firewardens.*—There shall be five district firewardens at salaries of one thousand dollars each per annum, with traveling and field expenses not to exceed seventy-five dollars per month, salaries and expenses to be paid by the State. The district firewardens shall be appointed by the State Forester, to serve during his pleasure, one for each of five districts, the boundaries of which shall be determined by the State Forester and subject to change by him; and, furthermore, any county or combination of less than four counties, shall be made a separate fire district upon request of the county board or boards of supervisors, in which case such special fire district shall pay two thirds, and the State one third, of the cost of maintaining its district firewarden.

SEC. 7. *Duties of District Firewardens.*—The duties of district firewardens shall be to devote their entire time to state forest interests according to rules and directions to be determined by the State Forester, with the approval of the State Board of Forestry. They shall take prompt measures to prevent and extinguish forest fires; keep a record of the cause, extent and damage of all forest fires in their respective districts, and perform such other duties as the State Forester may direct.

SEC. 8. *Voluntary Firewardens and their Duties.*—Each district firewarden shall appoint, subject to the approval of the State Forester, in such number and localities as he deems wise, public-spirited citizens to act as voluntary firewardens. They shall promptly report all fires to the respective district firewardens and take immediate and active steps toward their extinguishment, report any violation of the forest laws, assist in apprehending and convicting offenders, and give all possible assistance to the district firewarden. For all services in extinguishing fires and in apprehending and convicting offenders, payment shall be made by the State at the rate of twenty-five cents per hour for the time actually employed; *provided,* that payment for such services shall not be made to any Federal forest reserve officials who act as firewardens, and shall not in any case exceed fifty dollars to any one person during any year. The supervisors and rangers on the Federal forest reserve within the State, whenever they formally accept the duties and responsiblilities of firewardens, may be appointed as voluntary firewardens, and shall have all the powers given to firewardens by this act.

SEC. 9. *Powers and Requirements of Firewardens.*—The State Forester and all firewardens shall have the powers of peace officers to make arrests without warrant, for violations of any state or Federal forest laws, and no firewarden shall be liable to civil action for trespass committed in the discharge of his duties. Any firewarden who has information which would show, with reasonable certainty, that any person had violated any provision of such forest laws, shall immediately take action against the offender, either by using his own powers as a peace officer or by making complaint before the proper magistrate, or by information to the proper district attorney, and shall obtain all possible evidence pertaining thereto. Failure on the part of any firewarden to comply with the duties prescribed by this act shall be a misdemeanor, and punishable by a fine of not less than twenty dollars, nor more than two hundred and fifty dollars, or imprisonment for not less than ten days nor more than three months, or both such fine and imprisonment, and the State Forester is hereby authorized to investigate and prosecute such violations.

SEC. 10. *Assistance and Compensation of Citizens in Fighting Fires.*—All firewardens shall have authority to call upon able-bodied citizens between the ages of sixteen and fifty years, for assistance in putting out fires, and any such person who refuses to obey such summons, unless prevented by good and sufficient reasons, is guilty of a misdemeanor, and must be fined in a sum not less than fifteen dollars, nor more than fifty dollars, or imprisonment in the county jail of the county in which such conviction shall be had, not less than ten days, nor more than thirty days, or both such fine and imprisonment. Compensation for services in fighting fire under these provisions shall be made by the State at the rate of twenty cents per hour for the time actually employed. The firewarden in charge shall submit time record and itemized bill of the men employed, to the district firewarden, who shall examine it and forward it immediately to the State Forester with approval or criticism. The State Forester, if he approves the bill, shall forward it at once to the State for payment. In cases of emergency the district firewardens shall have power to incur expense for the transportation and other unavoidable expenses of fire fighters, and shall include the same with necessary vouchers, in their accounts.

SEC. 11. *Fire Patrol.*—In times and localities of particular fire danger the State Forester may maintain a fire patrol through the district firewardens, at such places in brush or forest land as the public interest may require, one half of the expense of such patrol to be paid by the county in which such patrol is maintained, and one half by the State; and, furthermore, he may, upon written request by the counties, corporations or individuals, maintain a fire patrol on their forest lands, *provided,* that two thirds of the expense of said patrol be paid by the party or parties requesting same, and the remaining one third by the State.

SEC. 12. *District Attorneys to Prosecute Vigorously.*—Whenever an arrest shall have been made for violation of any provision of this act, or whenever any information of such violation shall have been lodged with him, the district attorney of the county in which the criminal act was committed must prosecute the offender or offenders with all diligence and energy. If any district attorney shall fail to comply with the provisions of this section he shall be guilty of a misdemeanor, and upon conviction shall be fined not less than one hundred dollars nor more than one thousand dollars in the discretion of the court. Action against the district attorney shall be brought by the Attorney General in the name of the people of the State on the relation of the State Forester. The penalties of this section shall apply to any magistrate, with proper authority, who refuses or neglects to cause the arrest and prosecution of any person or persons when complaint, under oath, of violation of any terms of this act has been lodged with him.

SEC. 13. *Destruction of Warning Notices.*—Any person who shall destroy, deface, remove or disfigure any sign, poster or warning notice posted under the provisions of this act shall be guilty of a misdemeanor and punishable, upon conviction, by a fine of not less than fifteen dollars nor more than one hundred dollars, or imprisonment in the county jail for a period of not less than ten days nor more than three months, or both such fine and imprisonment.

Sec. 14. *Wilfully, Maliciously and Negligently Setting Forest Fires.*—Every person, who wilfully, maliciously or negligently sets on fire or causes or procures to be set on fire any woods, brush, prairies, grass, grain or stubble on any lands not his own, or allows the fire to escape from his own land, whereby any property of another is injured or destroyed, or accidentally sets any such fire or allows it to escape from his control without extinguishing it or using every effort to extinguish it, shall be guilty of a misdemeanor, and upon conviction is punishable by a fine of not less than fifty dollars, nor more than one thousand dollars, or imprisonment for not less than thirty days nor more than one year, or both such fine and imprisonment. Setting such fires or allowing them to escape shall be prima facie proof of wilfulness, malice or neglect under this section; *provided,* that nothing herein contained shall apply to a person who, in good faith, sets a back fire to check a fire already burning.

Sec. 15. *Extinguishment of Camp Fires.*—Every person who, upon departing from a camp or camping place, leaves fire burning or unextinguished, or who after building such fire allows it to spread, shall be guilty of a misdemeanor and punishable by a fine of not less than fifty dollars nor more than five hundred dollars, with costs of suit and collection, one half of such fine or such a portion thereof as shall not exceed fifty dollars, to be paid to the person securing the arrest and conviction of such offender, and if the defendant refuses or neglects to pay the fine and costs imposed, he shall be confined in the county jail of the county in which conviction shall be had, for a period not to exceed one day for every two dollars of the fine imposed, or may be subject to both such fine and imprisonment.

Sec. 16. *Restriction of Use of Fire in Dry Season.*—It shall be unlawful during what is locally known as the "dry season," this to be considered as the period between May fifteenth and the first soaking rains of autumn or winter, for any person or persons to burn brush, stumps, logs, fallen timber, fallows, grass or forest-covered land, or blast wood with dynamite, powder or other explosives, or set off fire works of any kind in forest or brush-covered land, either their own or the property of another, without written permission of and under the direction or supervision of the district firewarden; these restrictions not to apply to the ordinary use of fire or blasts in logging redwood, nor in cases where back-fires are set in good faith to stop an existing fire. Violation of these provisions shall be a misdemeanor, punishable, upon conviction, by a fine of not less than fifty dollars, nor more than one thousand dollars, or imprisonment not less than thirty days nor more than one year, or both such fine and imprisonment.

Sec. 17. *Engines in Forest Land.*—Logging locomotives, donkey or threshing engines, railway locomotives, and all other engines, boilers and locomotives operated in, through or near forests, brush or grass land, which do not burn oil as fuel, shall be provided with appliances which will prevent the escape of fire and sparks from the smokestacks thereof, and with adequate devices to prevent the escape of fire from ash pans and fire boxes. Failure to comply with these requirements shall be a misdemeanor, punishable, upon conviction, by a fine of not less than one hundred dollars nor more than five hundred dollars, and any officer or employee of a railroad company violating any provision of this section shall be liable to a penalty of not less than fifty dollars nor more than one hundred dollars, for every such violation, or imprisonment for not less than thirty days nor more than three months, or both such fines and imprisonment.

SEC. 18. *Civil Liability for Forest Fires.*—In addition to the penalties provided in sections 15, 16, 17, and 18 of this act, the United States, State, county, or private owners, whose property is injured or destroyed by such fires, may recover, in a civil action, double the amount of damages suffered if the fires accrued through wilfulness, malice or negligence; but if such fires were caused or escaped accidentally or unavoidably, civil action shall lie ony for the actual damage sustained as determined by the value of the property injured or destroyed, and the detriment to the land and vegetation thereof. The presumption of wilfulness, malice or neglect shall be overcome; *provided,* that the precautions set forth in section 18 are observed; *or, provided,* under section 17, fires are set during the "dry season" with written permission of and under the direction of the district firewarden. Persons or corporations causing fires by violations of sections 15, 16, 17, or 18 of this act shall be liable to the State in action for debt, to the full amount of all expenses incurred by the State in fighting such fires.

SEC. 19. *Clearing Along County Roads and Railroads.*—Counties, along the county roads, and railroad companies along their lines of road, in forest or brush land, shall, when so directed by the State Forester, and in a manner and to an extent prescribed by him, cut and remove all brush, grass and inflammable material from their rights of way. If such clearing is not done within a reasonable time after notice, said time to be fixed by the State Forester, the State Forester shall have it done and the county or railroad company shall be liable to the State in an action for debt to the amount of the expense thus incurred, and in addition thereto for the expense of any fire patrol rendered necessary by such delay; *it is provided, further,* that all lumber companies, corporations, or individuals shall, when so instructed by the State Forester, and at a time and in a manner prescribed by him, carefully burn their slashings, by which is meant the tops, limbs, and general débris left after lumbering.

SEC. 20. *Disposals of Moneys Received as Penalties.*—All moneys received as penalties for violations of the provisions of this act, less the cost of collection, and not otherwise provided for, shall be paid into the state treasury to the credit of the forestry fund, available only for purposes of forest protection, management and replacement.

SEC. 21. *Moneys for Forest Purposes.*—County boards of supervisors are hereby authorized to appropriate money for purposes of forest protection, improvement and management.

SEC. 22. *Payment of Expenses Under this Act.*—There is hereby appropriated for the remainder of the fifty-sixth fiscal year, and for the fifty-seventh and fifty-eighth fiscal years, the sum of fifty thousand dollars ($50,000.00) for carrying out the provisions of this act, and for the payment of all salaries and expenses herein provided for.

SEC. 23. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

CHAPTER CCLXIV.

An act to provide for the regulation of fires on, and the protection and management of, public and private forest lands within the State of California, creating a state board of forestry and certain officers subordinate to said board, prescribing the duties of such officers, creating a forestry fund, and appropriating the moneys in said fund, and defining and providing for the punishment of certain offenses for violations of the provisions of this act, and making an appropriation therefor.

(Approved March 18, 1905.)

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. *State Board of Forestry.*—There shall be a state board of forestry, consisting of the Governor, Secretary of State, Attorney General and State Forester, which shall supervise all matters of state forest policy and management and convene upon the call of the Governor or of its secretary.

SEC. 2. *State Forester and his Duties.*—There shall be a state forester, who shall be a civil executive officer, and who shall be a technically trained forester, appointed by the Governor to hold office at the pleasure of the appointing power; and whether any candidate for the position is a technically trained forester shall be determined by certificate from the secretary of the United States Department of Agriculture, or from the Department of Forestry of the State University after such department is established. He shall receive a salary of twenty-four hundred dollars per annum, and shall be authorized and empowered to appoint two assistant foresters, whose salaries shall not exceed twelve hundred dollars each per annum. He shall maintain headquarters at the State Capitol in an office provided by the Secretary of State, and shall be allowed necessary office and contingent expenses. He and his assistants shall be paid reasonable traveling and field expenses which may be incurred in the necessary performance of their official duties. He shall act as secretary of the State Board of Forestry. He shall, under the supervision of the State Board of Forestry, execute all matters pertaining to forestry within the jurisdiction of the State; have charge of all firewardens in the State, and direct and aid them in their duties; direct the protection and improvement of state parks and forests; collect data relative to forest destruction and conditions; take such action as is authorized by law to prevent and extinguish forest, brush, and grass fires; enforce all laws pertaining to forest and brush-covered land, and prosecute for any violation of such laws; cooperate with land owners, as described in section 4 of this act; and publish from time to time such information of forestry as he may deem wise. He shall prepare annually a report to the Governor on the progress and condition of state forest work, and recommend therein plans for improving the state system of forest protection, management and replacement.

SEC. 3. *Supervision and Care of State Parks.*—The California Redwood Park and the Mount Hamilton tract, together with all moneys heretofore or hereafter appropriated for the purchase of land for or care of said parks, tracts and stations, shall be in charge of the State Board of Forestry, said board to take the place of and forthwith shall have all the powers and duties now possessed in accordance with law by persons or commissions with regard to the state parks, tracts of land, and forest stations mentioned in this act, and also any forest or brush land which may hereafter become state property, or be placed definitely in the care of the State; and it is hereby further enacted that if the government of the United States or any individual or corporation shall, at any time, donate or entrust to the State of California, for state park or state forest reserve purposes, any tract or tracts of wholly or partially wooded land, such tract or tracts of land shall be administered at the expense of the State, as provided by law.

SEC. 4. *Cooperative Work.*—The State Forester shall, upon request and whenever he deems it essential to the best interests of the people and the State, cooperate with counties, towns, corporations and individuals in preparing plans for the protection, management and replacement of trees, woodlots and timber tracts, on consideration and under an agreement that the parties obtaining such assistance pay at least the field expenses of the men employed in preparing said plans.

SEC. 5. *Publication of Laws and Notices.*—The State Forester shall prepare and print for public distribution, an abstract of all the forest laws of California, together with such rules and regulations in accord therewith as he may deem necessary, and shall annually print and distribute a list of all firewardens with their addresses, all such matter to be published with the approval of the State Board of Forestry. He shall also furnish notices, printed in large letters on cloth, calling attention to the danger from forest fires and to forest fire and trespass laws and their penalties. Such notices shall be posted by the firewardens in conspicuous places along every highway in brush and forest-covered country, at frequent intervals along streams and lakes frequented by tourists, hunters or fishermen, at established camping sites, and in every post office in the forested region.

SEC. 6. *Fire Districts.*—The State Forester shall divide the State into such number of fire districts as shall be deemed by him most necessary to the efficiency of his work; and, furthermore, any county, or combination of less than four counties, shall be made a separate fire district, upon request of the county board or boards of supervisors, in which case such special fire district shall pay the cost of maintaining its district firewarden.

SEC. 7. *Duties of Assistant Foresters.*—The duties of the assistant foresters shall be to devote their entire time to state forest interests according to rules and directions to be determined by the State Forester, with the approval of the State Board of Forestry. They shall take prompt measures to prevent and extinguish forest fires; keep a record of the cause, extent and damage of all forest fires in their respective districts, and perform such other duties as the State Forester may direct.

SEC. 8. *Voluntary Firewardens and their Duties.*—The State Forester shall appoint, in such number and localities as he deems wise, public-spirited citizens to act as voluntary firewardens, who may receive payment for their services from the counties or from private sources. They shall promptly report all fires and take immediate and active steps toward their extinguishment, report any violation of the forest laws, assist in apprehending and convicting offenders, and perform such other duties as the State Forester may direct. The supervisors and rangers on the Federal forest reserve within the State, whenever they formally accept the duties and responsibilities of firewardens, may be appointed as voluntary firewardens, and shall have all the powers given to firewardens by this act.

SEC. 9. *Powers and Requirements of Firewardens.*—The State Forester and all firewardens shall have the powers of peace officers to make arrests without warrant, for violations of any State or Federal forest laws, and no firewarden shall be liable to civil action for trespass committed in the discharge of his duties. Any firewarden who has information which would show, with reasonable certainty, that any person had violated any provision of such forest laws, shall immediately take action against the offender, either by using his own powers as a peace officer or by making complaint before the proper magistrate, or by information to the proper district attorney, and shall obtain all possible evidence pertaining thereto. Failure on the part of any paid firewarden to comply with the duties prescribed by this act shall be a misdemeanor, and punishable by a fine of not less than twenty dollars, nor more than two hundred and fifty dollars, or imprisonment for not less than ten days nor more than three months, or both such fine and imprisonment and the State Forester is hereby authorized to investigate and prosecute such violations.

SEC. 10. *Assistance of Citizens in Fighting Fires.*—All firewardens shall have authority to call upon able-bodied citizens between the ages of sixteen and fifty years, for assistance in putting out fires, and any such person who refuses to obey such summons, unless prevented by good and sufficient reasons, is guilty of a misdemeanor, and must be fined in a sum not less than fifteen dollars, nor more than fifty dollars, or imprisonment in the county jail of the county in which such conviction shall be had, not less than ten days, nor more than thirty days, or both such fine and imprisonment; *provided*, that no citizen shall be called upon to fight fire a total of more than five days in any one year.

SEC. 11. *Fire Patrol.*—In times and localities of particular fire danger the State Forester may maintain a fire patrol, through the firewardens, at such places in brush or forest land as the public interest may require, the expense of such patrol to be paid by the county in which such patrol is maintained; and, furthermore, he may, upon written request by counties, corporations or individuals, maintain a fire patrol on their forest lands; *provided*, that the expense of said patrol be paid by the party or parties requesting same.

SEC. 12. *District Attorneys to Prosecute Vigorously.*—Whenever an arrest shall have been made for violation of any provision of this act, or whenever any information of such violation shall have been lodged with him, the district attorney of the county in which the criminal act was committed must prosecute the offender or offenders with all diligence and energy. If any district attorney shall fail to comply with the provisions of this section he shall be guilty of a misdemeanor, and upon conviction shall be fined not less than one hundred dollars nor more than one thousand dollars in the discretion of the court. Action against the district attorney shall be brought by the Attorney General in the name of the people of the State on the relation of the State Forester. The penalties of this section shall apply to any magistrate, with proper authority, who refuses or neglects to cause the arrest and prosecution of any person or persons when complaint, under oath, of violation of any terms of this act has been lodged with him.

SEC. 13. *Destruction of Warning Notices.*—Any person who shall destroy, deface, remove or disfigure any sign, poster or warning notice posted under the provisions of this act shall be guilty of a misdemeanor and punishable, upon conviction, by a fine of not less than fifteen dollars nor more than one hundred dollars, or imprisonment in the county jail for a period of not less than ten days nor more than three months, or both such fine and imprisonment.

SEC. 14. *Willfully, Maliciously and Negligently Setting Forest Fires.*—Every person, who willfully, maliciously or negligently sets on fire or causes or procures to be set on fire any woods, brush, prairies, grass, grain or stubble on any lands not his own, or allows the fire to escape from his own land, whereby any property of another is injured or destroyed, or accidentally sets any such fire or allows it to escape from his control without extinguishing it or using every effort to extinguish it, shall be guilty of a misdemeanor, and upon conviction is punishable by a fine of not less than fifty dollars, nor more than one thousand dollars, or imprisonment for not less than thirty days nor more than one year, or both such fine and imprisonment. Setting such fires or allowing them to escape shall be prima facie proof of willfulness, malice or neglect under this section; *provided,* that nothing herein contained shall apply to a person who, in good faith, sets a back-fire to check a fire already burning.

SEC. 15. *Extinguishment of Camp Fires.*—Every person who, upon departing from a camp or camping place, leaves fire burning or unextinguished, or who after building such fire allows it to spread, shall be guilty of a misdemeanor and punishable by a fine of not less than fifty dollars nor more than five hundred dollars, with costs of suit and collection, one half of such fine or such a portion thereof as shall not exceed fifty dollars to be paid to the person securing the arrest and conviction of such offender, and if the defendant refuses or neglects to pay the fine and costs imposed, he shall be confined in the county jail of the county in which the conviction shall be had, for a period not to exceed one day for every two dollars of the fine imposed, or may be subject to both such fine and imprisonment.

SEC. 16. *Restriction of Use of Fire in Dry Season.*—It shall be unlawful during what is locally known as the "dry season," this to be considered as the period between May fifteenth and the first soaking rains of autumn or winter, for any person or persons to burn brush, stumps, logs, fallen timber, fallows, grass or forest-covered land, or blast wood with dynamite, powder or other explosives, or set off fireworks of any kind in forest or brush-covered land, either their own or the property of another, without written permission of and under the direction or supervision of a firewarden in that district; these restrictions not to apply to the ordinary use of fire or blasts in logging redwood, nor in cases where back-fires are set in good faith to stop an existing fire. Violation of these provisions shall be a misdemeanor, punishable, upon conviction, by a fine of not less than fifty dollars, nor more than one thousand dollars, or imprisonment not less than thirty days nor more than one year, or both such fines and imprisonment.

SEC. 17. *Engines in Forest Land.*—Logging locomotives, donkey or threshing engines, and other engines and boilers operated in, through or near forests, brush or grass land, which do not burn oil as fuel, shall be provided with appliances to prevent the escape of fire and sparks from the smokestacks thereof, and with devices to prevent the escape of fire from ash pans and fire boxes. Failure to comply with these requirements shall be a misdemeanor, punishable, upon conviction, by a fine of not less than one hundred dollars nor more than five hundred dollars, and any person violating any provision of this section shall be liable to a penalty of not less than fifty dollars nor more than one hundred dollars, for every such violation, or imprisonment for not less than thirty days nor more than three months, or both such fine and imprisonment.

SEC. 18. *Civil Liability for Forest Fires.*—In addition to the penalties provided in sections 14, 15, 16 and 17 of this act, the United States, state, county, or private owners, whose property is injured or destroyed by such fires, may recover, in a civil action, double the amount of damages suffered if the fires occurred through willfulness, malice or negligence; but if such fires were caused or escaped accidentally or unavoidably, civil action shall lie only for the actual damage sustained as determined by the value of the property injured or destroyed, and the detriment to the land and vegetation thereof. The presumption of willfulness, malice or neglect shall be overcome; *provided*, that the precautions set forth in section 17 are observed; *or, provided,* under section 16, fires are set during the "dry season" with written permission of and under the direction of the district firewarden. Persons or corporations causing fires by violations of sections 14, 15, 16 and 17 of this act shall be liable to the state or county in action for debt, to the full amount of all expenses incurred by the state or county in fighting such fires.

SEC. 19. *Clearing Along County Roads and Land After Lumbering.*—Counties, along the county roads, in forest or brush land, shall, when so directed by the State Forester, and in a manner and to an extent prescribed by him, cut and remove all brush, grass and inflammable material from their rights of way. If such clearing is not done within a reasonable time after notice, said time to be fixed by the State Forester, the State Forester shall have it done and the county shall be liable to the State in an action for debt to the amount of the expense thus incurred, and in addition thereto for the expense of any fire patrol rendered necessary by such delay; *it is provided, further,* that all lumber companies, corporations, or individuals shall, when so instructed by the State Board of Forestry, and at a time and in a manner prescribed by said board, carefully burn their slashings, by which is meant the tops, limbs, and general débris left after lumbering.

SEC. 20. *Disposals of Moneys Received as Penalties.*—All moneys received as penalties for violations of the provisions of this act, less the cost of collection, and not otherwise provided for, shall be paid into the state treasury to the credit of the forestry fund, which fund is hereby created, and the moneys therein are hereby appropriated for purposes of forest protection, management and replacement under direction of the State Board of Forestry.

Sec. 21. *Moneys for Forest Purposes.*—County boards of supervisors may appropriate money for purposes of forest protection, improvement and management.

Sec. 22. *Payment of Expenses Under this Act.*—There is hereby appropriated for the fifty-seventh and fifty-eighth fiscal years, the sum of seventeen thousand six hundred dollars ($17,600.00) for carrying out the provisions of this act, and for the payment of all salaries and expenses herein provided for.

Sec. 23. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

FOREST LAWS OF CALIFORNIA NOW IN OPERATION.

ORGANIZATION OF STATE FOREST WORK.

Chapter 264, Laws of 1905 (p. 235).

An act to provide for the regulation of fires on, and the protection and management of, public and private forest lands within the State of California, creating a state board of forestry and certain officers subordinate to said board, prescribing the duties of such officers, creating a forestry fund, and appropriating the moneys in said fund, and defining and providing for the punishment of certain offenses for violations of the provisions of this act, and making an appropriation therefor.

SECTION 1. *State Board of Forestry.*—There shall be a state board of forestry, consisting of the Governor, Secretary of State, Attorney General and State Forester, which shall supervise all matters of state forest policy and management, and convene upon the call of the Governor or of its secretary.

SEC. 2. *State Forester and his Duties.*—There shall be a state forester, who shall be a civil executive officer, and who shall be a technically trained forester, appointed by the Governor to hold office at the pleasure of the appointing power; and whether any candidate for the position is a technically trained forester shall be determined by certificate from the secretary of the United States Department of Agriculture, or from the Department of Forestry of the State University after such department is established. He shall receive a salary of twenty-four hundred dollars per annum, and shall be authorized and empowered to appoint two assistant foresters, whose salaries shall not exceed twelve hundred dollars each per annum. He shall maintain headquarters at the State Capitol in an office provided by the Secretary of State, and shall be allowed necessary office and contingent expenses. He and his assistants shall be paid reasonable traveling and field expenses which may be incurred in the necessary performance of their official duties. He shall act as secretary of the State Board of Forestry. He shall, under the supervision of the State Board of Forestry, execute all matters pertaining to forestry within the jurisdiction of the State; have charge of all firewardens in the State, and direct and aid them in their duties; direct the protection and improvement of state parks and forests; collect data relative to forest destruction and conditions; take such action as is authorized by law to prevent and extinguish forest, brush, and grass fires; enforce all laws pertaining to forest and brush-covered land, and prosecute for any violation of such laws; cooperate with landowners, as described in section four in this act; and publish from time to time such information of forestry as he may deem wise. He shall prepare annually a report to the Governor on the progress and condition of state forest work, and recommend therein plans for improving the state system of forest protection, management and replacement.*

SEC. 3. *Supervision and Care of State Parks.*—The California Redwood Park and the Mount Hamilton tract, together with all moneys heretofore or hereafter appropriated for the purchase of land for or care of said parks, tracts and stations, shall be in charge of the State Board of Forestry, said board to take the place of and forthwith shall have all the powers and duties now possessed in accordance with law by persons or commissions with regard to the state parks, tracts of land, and forest stations mentioned in this act, and also any forest or brush land which may hereafter become state property, or be placed definitely in the care of the State; and it is hereby further enacted that, if the government of the United States or any individual or corporation shall, at any time, donate or intrust to the State of California, for state park or state forest reserve purposes, any tract or tracts of wholly or partially wooded land, such tract or tracts of land shall be administered at the expense of the State, as provided by law.[*][†]

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*Salary of State Forester increased in 1909 to $3,000. Provision regarding two assistant foresters amended at same time to one deputy forester at $1,800, and one assistant forester at $1,600.

SEC. 4. *Cooperative Work.*—The State Forester shall, upon request and whenever he deems it essential to the best interests of the people and the State, cooperate with counties, towns, corporations, and individuals in preparing plans for the protection, management and replacement of trees, woodlots and timber tracts, on consideration and under an agreement that the parties obtaining such assistance pay at least the field expenses of the men employed in preparing said plans.

SEC. 5. *Publication of Laws and Notices.*—The State Forester shall prepare and print for public distribution an abstract of all the forest laws of California, together with such rules and regulations in accord therewith, as he may deem necessary, and shall annually print and distribute a list of all firewardens with their addresses, all such matter to be published with the approval of the State Board of Forestry. He shall also furnish notices, printed in large letters on cloth, calling attention to the danger from forest fires, and to forest fire and trespass laws and their penalties. Such notices shall be posted by the firewardens in conspicuous places along every highway in brush and forest-covered country, at frequent intervals along streams and lakes frequented by tourists, hunters or fishermen, at established camping sites, and in every post office in the forested region.

SEC. 6. *Fire Districts.*—The State Forester shall divide the State into such number of fire districts as shall be deemed by him most necessary to the efficiency of his work; and, furthermore, any county, or combination of less than four counties, shall be made a separate fire district, upon request of the county board or boards of supervisors, in which case such special fire district shall pay the cost of maintaining its district firewardens.[§]

SEC. 7. *Duties of Assistant Foresters.*—The duties of the assistant foresters shall be to devote their entire time to state forest interests according to rules and directions to be determined by the State Forester, with the approval of the State Board of Forestry. They shall take prompt measures to prevent and extinguish forest fires; keep a record of the cause, extent and damage of all forest fires in their respective districts, and perform such other duties as the State Forester may direct.

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[*] One such tract was donated in 1909 by Mrs. Annie Bidwell of Chico.

[†] The California Redwood Park is now in charge of a commission appointed by the Governor. Chapter 12, Laws of 1911. [Approved February 6, 1911.]

[§] The original bill as presented to the legislature provided for five district firewardens to be paid by the State. This provision was not enacted into law and in consequence section 6 has no meaning.

SEC. 8. *Voluntary Firewardens and their Duties.*—The State Forester shall appoint, in such number and localities as he deems wise, public-spirited citizens to act as voluntary firewardens, who may receive payment for their services from the counties or from private sources. They shall promptly report all fires and take immediate and active steps toward their extinguishment, report any violation of the forest laws, assist in apprehending and convicting offenders, and perform such other duties as the State Forester may direct. The supervisors and rangers on the Federal forest reserves within the State, whenever they formally accept the duties and responsibilities of firewardens, may be appointed as voluntary firewardens, and shall have all the powers given to firewardens by this act.

SEC. 9. *Powers and Requirements of Firewardens.*—The State Forester and all firewardens shall have the powers of peace officers to make arrests without warrant, for violations of any state or Federal forest laws, and no firewarden shall be liable to civil action for trespass committed in the discharge of his duties. Any firewarden who has information which would show with reasonable certainty, that any person had violated any provision of such forest laws, shall immediately take action against the offender, either by using his own powers as a peace officer or by making complaint before the proper magistrate, or by information to the proper district attorney, and shall obtain all possible evidence pertaining thereto. Failure on the part of any *paid* firewarden to comply with the duties prescribed in this act shall be a misdemeanor, and punishable by a fine of not less than twenty dollars nor more than two hundred and fifty dollars, or imprisonment for not less than ten days nor more than three months, or both such fine and imprisonment, and the State Forester is hereby authorized to investigate and prosecute such violations.

SEC. 10. *Assistance of Citizens in Fighting Fire.* (Penal Code, sec. 384, subsec. 5.)

SEC. 11. *Fire Patrol.*—In times and localities of particular fire danger the State Forester may maintain a fire patrol through the firewardens, at such places in brush or forest land, as the public interest may require, the expense of such patrol to be paid by the county in which such patrol is maintained; and, furthermore, he may, upon written request by counties, corporations or individuals, maintain a fire patrol on their forest lands; *provided,* that the expense of said patrol be paid by the party or parties requesting same.

SEC. 12. *District Attorneys to Prosecute Vigorously.*—Whenever an arrest shall have been made for violation of any provision of this act, or whenever any information of such violation shall have been lodged with him, the district attorney of the county in which the criminal act was committed must prosecute the offender or offenders with all diligence and energy. If any district attorney shall fail to comply with the provisions of this section he shall be guilty of a misdemeanor, and upon conviction shall be fined not less than one hundred dollars nor more than one thousand dollars, in the discretion of the court. Action against the district attorney shall be brought by the Attorney General in the name of the people of the State on the relation of the State Forester. The penalties of this section shall apply to any magistrate, with proper authority, who refuses or neglects to cause the arrest and prosecution of any person or persons when complaint, under oath, of violation of any terms of this act has been lodged with him.

Sec. 13. *Destruction of Warning Notices.*—Any person who shall destroy, deface, remove or disfigure any sign, poster or warning notice posted under the provisions of this act shall be guilty of a misdemeanor and punishable, upon conviction, by a fine of not less than fifteen dollars nor more than one hundred dollars, or imprisonment in the county jail for a period of not less than ten days nor more than three months, or both such fine and imprisonment.

Sec. 14. *Willfully, Maliciously, and Negligently Setting Forest Fires.* (Penal Code, sec. 384, subsec. 1.)

Sec. 15. *Extinguishment of Camp Fires.* (Penal Code, sec 384, subsec. 6.)

Sec. 16. *Restrictions of Use of Fire during a Dry Season.* (Penal Code, sec. 384, subsec. 3.)

Sec. 17. *Engines in Forest Land.* (Penal Code, sec. 384, subsec. 4.)

Sec. 18. *Civil Liability for Forest Fires.*—In addition to the penalties provided in this act, the United States, State, county, or private owners, whose property is injured or destroyed by such fires, may recover in a civil action, double[*] the amount of damages suffered if the fires occurred through willfulness, malice or negligence; but if such fires were caused or escaped accidentally or unavoidably, civil action shall lie only for the actual damage sustained as determined by the value of the property injured or destroyed, and the detriment to the land and vegetation thereof. The presumption of willfulness, malice or neglect shall be overcome; *provided,* that the precautions set forth are observed; *or, provided,* fires are set during a "dry season" with written permission of and under the direction of the district firewarden. *Persons or corporations causing fires by violations of this act shall be liable to the state or county in action for debt, to the full amount of all expenses incurred by the State or county in fighting such fires.*

Section 19 of the above entitled act, approved March 18, 1905, is hereby amended so as to read as follows:

Sec. 19. *Inspection of Forest Area.*—It shall be the duty of the State Board of Forestry, whenever it shall be deemed necessary, to notify the owner of any forest area within the State by a written notice to be served upon the person or persons or corporation, or either of them, owning or having charge of such area, or upon the agents, attorney or representative of either, by any firewarden, deputy firewarden or special firewarden or any employee of the State Board of Forestry, in the same manner as a summons in a civil action, or if such area belongs to any non-resident person or corporation and there is no person in control or possession thereof, and such nonresident person or corporation has no tenant, attorney, representative or agent upon whom such service can be had, or if the owner or owners of such area or their tenants, attorneys, representatives, or agents, can not after due diligence be found, then by posting said notice in some conspicuous place upon such area and by mailing a copy thereof to the owner thereof at his last known place of residence if the same is known or can be ascertained, that the said State Board of Forestry intends to cause an inspection to be made of the said forest area for the purpose of ascertaining whether or not the same constitutes a nuisance as hereinafter provided. The said notice shall describe the forest area to be inspected by general description and shall designate the time of such inspection. At the time so designated in said notice the said State Board of Forestry shall cause an inspection to be made of the said forest area and the said owner or his agent shall be permitted to be present during such inspection and shall be given a full opportunity of showing that such forest area is not a nuisance as contemplated by this act. If the said State Board of Forestry after such inspection finds any forest area inadequately protected adjoining, lying near, or intermingled with other forest and covered wholly or in part with inflammable débris, which by reason of such location or condition or lack of protection endangers life or property, the State Board of Forestry shall in writing notify the owner or owners of such areas that the condition of said areas endangers life or property and shall require such person or corporation to clean up such areas by the use of fire or otherwise at a time and in a manner to be therein specified. Said notice may be served upon the person or persons or corporation or either of them, owning or having charge of such areas or upon the agents of either, by any firewarden, deputy firewarden or special firewarden or any employee of the State Board of Forestry, in the same manner as a summons in a civil action; *provided, however,* that if any such area belong to any non-resident person or corporation and there is no person in control or possession thereof and such non-resident person or corporation has no tenant, bailee, depository or agent upon whom such service can be had; or if the owner or owners of such areas can not after due diligence be found, then such notice may be served by posting the same in some conspicuous place upon such area, and by mailing a copy thereof to the owner thereof at his last known place of residence, if the same is known or can be ascertained. Any and all such inadequately protected forest areas adjoining, lying near, or intermingled with other forest and covered wholly or in part with inflammable débris, which by reason of such location or condition or lack of protection endangers life or property, are hereby declared to be a public nuisance; and whenever any such nuisance shall exist within the State, and the proper notice shall have been served, as herein provided, and the time specified in said notice shall have elapsed without the nuisance having been abated, it shall be the duty of the State Board of Forestry to cause said nuisance to be at once abated, by burning or otherwise disposing of the inflammable débris. The expense thereof shall be paid by the State in like manner as bills for fire fighting are paid. Any and all such sum or sums so paid shall be and become a lien on the property from which said nuisance has been removed or abated in pursuance of this section, and said lien shall continue as long as the said sum or sums above referred to shall remain unpaid. The claim for any lien shall be filed by the State Forester, or under his direction, by any of his assistants or firewardens, in the office of the county recorder of the county in which the property on which said nuisance existed is situated. Proceedings for the enforcement of such lien shall be instituted by the district attorney of the county where the nuisance existed, at the request of the State Board of Forestry and in the name of the

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[*] Section 3344 of the Political Code states that "Every person negligently setting fire to his own woods, or negligently suffering any fire to extend beyond his own land, is liable in treble damages to the party injured." Treble damages are changed to double damages by the above section.

State of California as claimant; and the costs shall be recovered in the usual manner. The State Board of Forestry is hereby vested with the power to cause any and all such nuisances to be abated in a summary manner.

SEC. 20. *Disposal of Moneys Received as Penalties.*—All moneys received as penalties for violations of the provisions of this act, less the cost of collection, and not otherwise provided for, shall be paid into the state treasury to the credit of the forestry fund, which fund is hereby created, and the moneys therein are hereby appropriated for purposes of forest protection, management and replacement under direction of the State Board of Forestry.*

SEC. 21. *Moneys for Forest Purposes.*—County boards of supervisors may appropriate money for purposes of forest protection, improvement and management.

SEC. 22. *Payment of Expenses Under this Act.*—There is hereby appropriated for the fifty-seventh and fifty-eighth fiscal years, the sum of seventeen thousand six hundred dollars ($17,600) for carrying out the provisions of this act, and for the payment of all salaries and expenses herein provided for.

SEC. 23. All acts or parts of acts inconsistent with the provisions of this act are hereby repealed.

COUNTY COOPERATION.

The provisions made by the above sections 4, 6, 8, 11, 19, and 21 for the cooperation of counties with the State is supplanted by the following act (Stats. 1905, 394):

SECTION 1. A new section is hereby added to the act to establish a uniform system of county and township governments, to be numbered 33½, and to read as follows:

Section 33½. To appropriate from the general fund of the county, unless otherwise provided, not exceeding in counties of the first and second class the sum of twenty thousand dollars, and in all other counties not exceeding the sum of ten thousand dollars in any one year, to aid and carry on the work of the preservation of forests upon public lands, the reforestation of forests upon public lands, and the protection of forests upon public lands from fire.

FIRE LAWS AND PENALTIES.

CHAPTER 699.

An act to amend section 384 of the Penal Code, relating to forest fires.

(Approved May 1, 1911.)

The people of the State of California, represented in senate and assembly, do enact as follows:

SECTION 1. Section 384 of the Penal Code is hereby amended to read as follows:

Setting fire wilfully or negligently.

384. Any person who shall wilfully or negligently commit any of the acts hereinafter enumerated in this section shall be guilty of a

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*All fines collected to go to the county.

misdemeanor, and upon conviction thereof be punishable by a fine of not less than fifty nor more than five hundred dollars, or imprisonment in the county jail not less than fifteen days nor more than six months, or both such fine and imprisonment, except that in the case of an offense against subsection five of this section, the fine imposed may be not less than ten dollars.

1. Back-firing.

Setting fire, or causing or procuring fire to be set to any forest, brush or other inflammable vegetation growing on lands not his own, without the permission of the owner of such land; *provided,* that no person shall be convicted under this section who shall have set, in good faith and with reasonable care, a back-fire for the purpose of stopping the progress of a fire then actually burning.

2. Allowing fire to escape.

Allowing fires to escape from the control of the persons having charge thereof, or to spread to the lands of any person other than the builder of such fire without using every reasonable and proper precaution to prevent such fire from escaping.

3. Carelessness with fire.

Burning brush, stumps, logs, rubbish, fallen timber, fallows or grass on his own land, or blasting with dynamite, powder or other explosives, or setting off fireworks in forest or brush-covered land, either his own or the property of another, without taking every proper and reasonable precaution both before the lighting of said fire and at all times thereafter to prevent the escape thereof; *provided,* that any firewarden may, in his discretion, give a written permit to any person desiring to burn or blast as aforesaid; such permit shall contain such rules and regulations for the building and management of such fires as the State Board of Forestry may from time to time prescribe; and in any prosecution under this subsection it shall be prima facie evidence that the defendant has taken proper and reasonable precautions to prevent the escape of such fire, when he shall show that he has received such a permit and has complied with all the rules and regulations therein prescribed.

4. Locomotives, engines and boilers.

Using any logging locomotive, donkey or threshing engine, or any other engine or boiler, in or near any forest, brush or grass land, unless he shall prove upon trial, affirmatively, that such engines or boilers used by him were provided with adequate devices to prevent the escape of fire or sparks from smokestacks, ashpans, fireboxes, or other parts, and that he has used every reasonable precaution to prevent the causing of fire thereby.

5. Obliged to fight fire when called upon.

Refusing or failing to render assistance in combatting fires at the summons of any firewarden unless prevented by good and sufficient reasons.

6. Allowing fires to escape.

Leaving fire burning or unextinguished on departing from a camp or camping place, or allowing such fire to spread after being built.

7. Municipal corporation.

The provisions of this section shall not apply to the setting of fire on lands within any municipal corporation of the State.

SEC. 2. All acts and parts of acts in conflict herewith are hereby repealed.

MALICIOUSLY SETTING FIRE.

PENAL CODE, SEC. 600. Every person who wilfully and maliciously burns any bridge exceeding in value fifty dollars, or any structure, snowshed, vessel or boat, not the subject of arson, or any tent, or any stack of hay or grain or straw of any kind, or any pile of baled hay or straw, or any pile of potatoes, or beans, or vegetables, or produce, or fruit of any kind, whether sacked, boxed, or crated, or not, or any growing or standing grain, grass, or tree, or any fence, or any railroad car, lumber, cord wood, railroad ties, telegraph or telephone poles, or shakes, or any tule land or peat ground of the value of twenty-five dollars or over, not the property of such person, is punishable by imprisonment in the state prison for not less than one year nor more than ten years.

UNLAWFUL CUTTING AND INJURY.

Timber trespass a misdemeanor.

PENAL CODE, SEC. 602. Every person who wilfully commits trespass by either—

1. Cutting down, destroying, or injuring any kind of wood or timber standing or growing upon the lands of another; or,
2. Carrying away any kind of wood or timber lying on such lands

—is guilty of a misdemeanor.

Civil liability for timber trespass.

CIVIL CODE. SEC. 3346. For wrongful injuries to timber, trees or underwood, upon the lands of another, or removal thereof, the measure of damages is three times such a sum as would compensate for the actual detriment, except where the trespass was casual and involuntary, or committed under the belief that the land belonging to the trespasser, or where the wood was taken by the authority of highway officers for the purposes of a highway; in which cases the damages are a sum equal to the actual detriment.

CODE OF CIVIL PROCEDURE, SEC. 733. Any person who cuts down or carries off any wood or underwood, tree or timber, or girdles or otherwise injures any tree or timber on land of another person, * * * without lawful authority, is liable to the owner of such land * * * for treble the amount of damages which may be assessed therefor, in a civil action, in any court having jurisdiction.

CODE OF CIVIL PROCEDURE, SEC. 734. Nothing in the last section authorizes the recovery of more than the just value of the timber taken from uncultivated woodland, for the repair of a public highway or being upon the land adjoining it.

NOTE.—The Political Code, section 3345, states that "Whenever the woods are on fire any justice of the peace, constable, or road overseer of the township or district where the fire exists, may order as many of the inhabitants liable to poll tax, residing in the vicinity, as may be deemed necessary, to repair to the place of the fire and assist in stopping, or extinguishing it." It may sometimes be necessary for fire fighters to take advantage of this privilege where no firewarden is available.

An act to amend an act entitled "An act to provide for the regulation of fires on, and the protection and management of, public and private forest lands within the State of California, creating a state board of forestry and certain officers subordinate to said board, prescribing the duties of such officers, creating a forestry fund, and appropriating the moneys in said fund, and defining and providing for the punishment of certain offenses for violations of the provisions of this act, and making an appropriation therefor," approved March 18, 1905. [Amendment introduced in 1913.]

The people of the State of California do enact as follows:

SECTION 1. Section six of the above entitled act is hereby amended to read as follows:

6. The State Forester shall divide the State into such number of fire districts as shall be deemed by him most necessary to the efficiency of his work. He shall create and maintain, during the dry season, a fire patrol system, and make rules and regulations for the prevention and suppression of fires in any timber, brush, grass or other inflammable vegetation or material. He may appoint a district firewarden for each of said districts so established, and he may also employ within such districts such number of fire patrolmen as, in his judgment. may be required to carry out the provisions of this act, assigning to each of the latter the territory over and within which they shall have jurisdiction and fix the amount of the compensation for all district firewardens and fire patrolmen for services actually rendered which shall not exceed the rate of seventy-five dollars per month; the district firewardens and the fire patrolmen may be paid necessary traveling and field expenses. They shall devote their entire time to the prevention and extinguishment of fire in any timber, brush, grass or other inflammable vegetation or material in their respective districts, and the performance of such other duties as the State Forester may direct. The State Forester shall have the power to remove any officer or employee appointed or employed by him. He may purchase necessary equipment, instruments and field supplies. He shall have authority to establish lookout stations and telephone or other systems of communication connecting the same, and to equip and maintain depots for the storing of tools for the extinguishment of forest fires. For the purpose of controlling and extinguishing fires in any timber, brush. grass or other inflammable vegetation or material the State Forester is authorized to summon and employ suitable persons for controlling and extinguishing such fires and to delegate this authority to the district firewardens and fire patrolmen. and each person so summoned or employed may be paid twenty-five cents for each hour of service rendered by him and be provided with subsistence during such service; *provided,* no owner, lessee, or person in control of lands upon which fires may be burning or threatening. or any one in the employ of such owner, lessee or person in control shall receive any compensation from the State for extinguishing or controlling any such fire.

The State Forester may and hereby is authorized to enter into agreements with persons, firms, associations, or corporations owning or controlling land covered wholly or in part by timber, brush, grass or other inflammable vegetation or material, or with any group or groups of persons, firms, associations or corporations owning or controlling such land for the purpose of cooperation in maintaining a fire patrol system for preventing and suppressing fires in timber, brush, grass, or ot inflammable vegetation or material which endanger or are liable to endanger life or property or life and property. Such agreements may provide that persons, firms, associations or corporations owning or controlling land covered wholly or in part by timber, brush, grass or other inflammable vegetation or material, or group or groups of persons, firms, associations or corporations owning or controlling such land shall bear part or all of the expenses of maintaining such fire patrol system, and no such agreement shall become effective until the person, firm, association or corporation or groups of persons, firms, associations or corporations entering into such agreement shall have paid, into the fund, hereinafter provided for the maintenance of a fire patrol system their pro rata of the expenses stipulated by the terms of the agreement. A fund in the state treasury, to be known as the fire patrol maintenance fund, is hereby created, into which shall be paid the money for the expenses of maintaining the cooperative fire patrol system, as heretofore provided for, in such amounts and at such times as the agreement may direct. All claims presented for payment from the fire patrol maintenance fund shall be audited and paid in a similar manner as other claims against the State. The State Forester may enter into agreements with the Federal Government, under such terms as he deems advisable or as may be provided for by law, for the purpose of maintaining a fire patrol system for preventing and suppressing fires in any timber, brush, grass or other inflammable vegetation or material. The expense incurred in preventing and extinguishing fires in any timber, brush, grass or other inflammable vegetation or material as provided by law shall be paid from the appropriation or funds available for fire protection.

Sec. 2. Section eleven of the above entitled act is hereby amended to read as follows:

11. Wherever in this act the performance or nonperformance of any act or thing is made a misdemeanor, the person, or the officer, member, manager, agent, director, or employee of any fire association, or corporation who shall direct the performance or nonperformance of such act or thing is likewise and in the same manner guilty of a misdemeanor and shall be punished in a like manner as the person actually performing such act or thing.

Sec. 3. Section eighteen of the above entitled act is hereby amended to read as follows:

18. Any fire in any timber, brush, grass or other inflammable vegetation or material, burning uncontrolled and without proper precaution being taken to prevent it from spreading, and which endangers or may endanger life or property, is hereby declared to be a public nuisance; and any person, firm, association or corporation owning or controlling lands upon which such nuisance exists is hereby required to abate it immediately by controlling or extinguishing it. In addition to the penalties provided in this act, the United States, State, county, or private owners, whose property is injured or destroyed by such fires, may recover in a civil action, double the amount of damages suffered if the fires occurred through wilfulness, malice or negligence; but if such fires were caused or escaped accidentally or unavoidably, civil action may lie only for the actual damage sustained as determined by the value of the property injured or destroyed, and the detriment to the land and vegetation thereof. The presumption of

wilfulness, malice or neglect shall be overcome; *provided,* that the precautions set forth are observed; *or, provided,* fires are set during a "dry season" with written permission of and under the direction of the district firewarden. Persons or corporations causing fires by violations of this act shall be liable to the State or county in action for debt, to the full amount of all expenses incurred by the State or county in fighting such fires; such expenses, less cost of collection, shall be paid into the state or county treasury, as the case may be, to the credit of the appropriation or fund for fire protection.

SEC. 4. Section nineteen of the above entitled act is hereby amended to read as follows:

19. All inflammable débris upon forest areas, which by reason of its location or condition or lack of protection may endanger life or property, is hereby declared to be a public nuisance. If the State Forester finds that such a nuisance exists, he shall in writing notify the owner, lessee, the person in control, or the agent of said owner or lessee of the land on which said nuisance is situated of the existence of such nuisance, and shall require that such nuisance be abated within a period and in a manner specified in such notice. But the State Forester may, for good cause shown, extend the time in which such nuisance shall be abated. Whenever such nuisance exists and the proper notice shall have been served, and the period specified in such notice, or any extension thereof, shall have elapsed, without the nuisance having been abated, it shall be the duty of the State Forester to cause the same to be summarily abated. Any notice provided for in this section shall be served in a like manner as a summons in a civil action as provided by the Code of Civil Procedure. The expense of the summary abatement of a nuisance as provided in this act may be paid from the money appropriated for fire protection. Any and all expenses incurred for the summary abatement of a nuisance under the provisions of this act shall be and become a lien on the lands upon which such nuisance shall have existed, the said expenses to be prorated among the owners of such lands according to the number of acres belonging to said owners on which said nuisance was abated. Action to foreclose such lien shall be begun within one year. Such lien shall be filed by the State Forester or under his direction by any of his assistants or firewardens within ninety days after the abatement of such nuisance. Proceedings for the satisfaction of such lien shall be instituted, at the request of the State Board of Forestry and in the name of the people of the State of California by the district attorney of the county in which such nuisance was abated; and the costs shall be recovered in the usual manner and paid into the state treasury to the credit of the appropriation or fund for fire protection.

CHAPTER 247.

An act to require owners of timber lands to provide a fire patrol therefor.

Be it enacted by the people of the State of Oregon:

SECTION 1. Every owner of timber land in the State of Oregon shall furnish or provide a sufficient fire patrol therefor, during the season of the year when there is danger of forest fires, which patrol shall meet with the approval of the State Board of Forestry.

SEC. 2. In case any owner or owners shall fail or neglect to provide such fire patrol, then the State Forester, under direction from the State Board of Forestry, shall provide the same at a cost not to exceed five (5) cents per acre per annum. Any amounts so paid or contracted to be paid by the State Forester, shall be a lien upon the property, and shall be reported by the State Forester to the county court of the county in which such lands are situated, and shall by such court be levied and collected with the next taxes on such lands in the same manner as taxes are collected. Said county court shall instruct the proper officer to extend the amounts on the assessment roll in a separate column, and the procedure provided by law for the collection of taxes and delinquent taxes shall be applicable thereto, and upon collection thereof the county court shall repay the same to the State Forester to be applied to the expenses incurred in carrying out the provisions of this act.

SEC. 3. For the purposes of this act, any land shall be considered timber land which has enough timber standing or down, to constitute, in the judgment of the State Board of Forestry, a fire menace to itself or adjoining lands.

SEC. 4. The owner of any land coming under the provisions of this act, who shall reside within one and one half miles of said land, shall be considered, by virtue of said residence, to maintain a sufficient fire patrol, and shall not be compelled to maintain additional patrol on such land.

SEC. 5. For the purposes of this act, an adequate fire patrol shall be construed to mean one equal to that maintained by 50 per cent of timber owners in the same locality, or under similar conditions in other localities, who are in good faith patrolling their lands against fire.

Filed in the office of the Secretary of State February 26, 1913.

CALIFORNIA
STATE BOARD OF FORESTRY

CIRCULAR No. 5

THE FOREST PROTECTION PROBLEM IN CALIFORNIA

1914

CALIFORNIA
STATE PRINTING OFFICE

STATE BOARD OF FORESTRY.

HIRAM W. JOHNSON	Governor
FRANK C. JORDAN	Secretary of State
U. S. WEBB	Attorney General
G. MORRIS HOMANS	State Forester

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G. MORRIS HOMANS	State Forester
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J. A. HARNEY	Clerk

THE FOREST PROTECTION PROBLEM IN CALIFORNIA.

CALIFORNIA stands third in the extent of her forest wealth. Where does she stand in the practice of forest protection? The answer to this question is decidedly inconsistent with the fact that conditions in our State demand special precautionary measures for the protection of forest areas. Many states have developed and are now enjoying effective protective forest policies. California has done practically nothing to insure the conservation of her forests. Is the problem worth solving? It can not be denied that forests affect, in some way, every industry, and further, produce a marked effect upon the health and happiness of the citizens of the State. What must be accomplished will be accomplished, but not before we as citizens demand that it shall be. We have passed the time beyond which further delay means loss of time, money and, above all, human lives. The problem is neither the discovery of some suitable machine of operation nor the preparation of lengthy, in-need-of-amendment bills; but resolves itself primarily into the hearty support and adoption of measures already introduced in our legislature and already passed and in effective operation in other states. A brief historical outline of forest legislation in California will show clearly the situation.

The first public sentiment in favor of forestry work in California found expression in an act passed March 3, 1885, creating a state board of forestry. At first this board acted in the capacity of a commission of inquiry with emphasized educational functions. By an amendment police powers were conferred in 1887 for the purpose of making arrests for any violation of any law applying to forest and brush land within the State, or prohibiting the destruction thereof, with an appropriation of $30,000.00

for the following two years. Two experiment stations were maintained, and the board published three reports on the forest conditions and the forest trees of the State. Little could be accomplished in efficient protective work, and, suffering at the hands of reckless politicians, the act was repealed in 1893. Possession and supervision of the experiment stations passed over to the State University, and the board of forestry was abolished.

The act of March 16, 1903 (Stat. 1903, p. 171, Ch. CLV, Cal.), provides as follows: "The state board of examiners is hereby empowered to enter into contracts * * * with the chief of the bureau of forestry and the department of agriculture for the purpose of studying the forest resources of the State and their proper conservation, and especially with a view of formulating a proper state forest policy, to the extent of fifteen thousand dollars. * * *"

The act of March 18, 1905 (Stat. 1905, p. 152, Ch. CLVII, Cal.), provides as follows: "The state board of examiners is hereby empowered to enter into contracts * * * with the chief of the bureau of forestry and the department of agriculture for the purpose of studying the forest resources of the State and their proper conservation, and especially with a view of formulating a proper state forestry policy to the extent of ten thousand dollars. * * *"

Cooperation under the provisions of the above acts was secured and field investigations were begun by agents of the Forest Service on July 1, 1903, and the final reports were completed in the spring of 1907.

The fire study was finished in time for the 1905 session of the legislature, "and a bill embodying the views of the United States Forest Service" was introduced.* This bill was supported by the Forest Service, the California Water and Forest Association, by other associations and by public-spirited individuals. It aimed toward adequate provision for forest fire protection by the State. The bill was strongly opposed but finally passed as the act of March 18, 1905 (Annual Fire Report, 1913, Cal., p. 77), after destructive amendments had eliminated practically all of the protective features. This is the law, with a few amendments (Annual Fire Report, 1913, Cal., p. 83), under which we are working to-day.

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*Report of the Fifth National Conservation Congress, "Fire Prevention by States, by the Federal Government and by Private Interests," page 25.

THE FOREST LAW NOW IN FORCE.

Under the present law the State Forester is limited in his service to the State by the following unfortunate circumstances:

1. No money is set aside for state fire protection. This obviously prevents the execution of essential measures by the State Board of Forestry.

2. The State has no greater working force than the voluntary firewardens who serve willingly and unwillingly without compensation. The system has failed wherever it has been employed.

3. The State owns and maintains no forest reserves. No forest experiment stations or forest nurseries are operated by the State.

4. There is an organized opposition to legislation directed toward the establishment of a strong and effective forest policy. This opposition has found expression in an endeavor to embarrass measures proposed for the purpose of actual state activity and state supervision of forest protection.

5. The present law enables the State Board of Forestry to make a few special field investigations, but the scope is not broad enough to include sufficient protective work. When money is spent for fighting fires, it is done at the expense of other departments of the work if such money is not appropriated for fire protection.

OPPOSITION TO NEEDFUL FOREST LAWS.

The fact remains that California has spent many thousand dollars in an endeavor to secure a strong forest policy; and the purpose of this expenditure has been largely defeated by opposition. Opposing factors have failed to present measures and means equally sufficient to meet the requirements. Objection to forest regulation by the State may be expected on the part of individuals who fail to view the fire danger in its true light. If proper restrictions had been voluntarily imposed by a majority of lumbermen and landowners, it is safe to assume that legislation directed toward state supervision of forest protection would be generally approved. We believe that there can not be any well directed opposition to a strong state forest protective plan—a plan which recognizes the limitation of economic conditions; and that private owners should not be required to adopt a practice which entails a financial loss; and that the State should undertake to accomplish protection for the benefit of the public.

DURING THE 1913 SESSION.

Two forestry bills were introduced during the last session. One, which made provision for an adequate system of fire patrols, for fire fighting and an appropriation for this purpose, received the hearty support of the California Federation of Women's Clubs. This bill embraced practically all of the essential features contained in the proposed bill of 1905 for which California spent $25,000.00 in cooperation with the Federal Forest Service, in securing data requisite to the preparation of such an adequate state forest policy. The second bill endorsed the method of letting the various associations do the work in cooperation with the State, but provided that expenses be paid not by the State. In our opinion, this intermediate step is unnecessary. There are but few protective associations in California and conditions now demand that the State tackle bigger things, plans that will yield results. Neither bill became law. In the general budget $50,000.00 was granted for fire protection, but the defeat of the bill providing for its expenditure rendered this amount inaccessible.

FOREST FIRE LOSS IN CALIFORNIA IN 1913.

The total area of merchantable forest in California is, approximately, 12,786,306 acres. The total area of timber land burned over in California during 1913 is 61,812 acres. The total forest fire damage amounted to $511,077.00, an amount adequate to maintain an efficient system of protection for several years. Three human lives were sacrificed, and the lives of many of our wild animals claimed as toll for our neglect.

DURING THE NEXT LEGISLATIVE SESSION.

The State Board of Forestry will present another bill in the next legislature. It will embrace the same general features that were so strongly endorsed by the California Federation of Women's Clubs. Among these features are:

1. The adoption of a system of paid firewardens and patrols.
2. The designation and appropriation of a forest protective fund, and the substance of the proposed bill of 1905.

These two features alone will enable the State to lessen the great annual fire loss. Let us, as citizens of California, in addition to our pride of resources and climate, want to be proud of our systematic forest protection. Let us do our part in solving the problem by giving our support to legislation directed toward the adoption of the above essential features.

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CALIFORNIA STATE BOARD OF FORESTRY

THE GOVERNOR HAS PROCLAIMED
APRIL 18, 1914

FIRE PREVENTION DAY

—A LESSON—

WINTER AND SPRING WORK TO PREVENT SUMMER FIRES.

APRIL 18

MR·CITIZEN · MR·OFFICIAL · MR·TIMBERMAN

WILL YOUR CHILDREN HAVE TIMBER TO BURN?

1914

CALIFORNIA STATE PRINTING OFFICE

CALIFORNIA STATE BOARD OF FORESTRY.

HIRAM W. JOHNSON	***Governor***
FRANK C. JORDAN	***Secretary of State***
U. S. WEBB	***Attorney General***
G. M. HOMANS	***State Forester***

SUGGESTIONS TO TEACHERS.

ARBOR DAY has passed and in observance of its true purpose the school children of California have been impressed with the real value of a tree as an individual and of many trees as a forest. The tree carefully planted in the school yard has been placed there and will be protected for the future. So the spirit of Arbor Day remains. Nature enjoys 365 arbor days each year; but, what is being done to develop and protect the thousands of little trees she so faithfully endeavors to offer? They stand alone remote from cities and towns, born to struggle against many a foe, a humble struggle against wind and storms that the children of to-day may in years to come find shelter and pleasure under their branches; that the homes of years to come may be built of wood as we build our homes to-day.

The greatest enemy of our forests is fire. Many of the forest fires are preventable, but the State has done nothing to insure their prevention. We may delay in a futile attempt to convince ourselves that the situation is not so serious as annual figures of loss indicate; nevertheless, the problem of forest protection is one that actually and logically confronts the State. The spirit of Arbor Day will fail to stand the test of consistency if we neglect our duty of protecting the forests planted by nature. True consistency must find expression in a living endeavor to teach our school children how to use and conserve that with which we must learn to leave them provided, namely, the forests.

The necessity of fire prevention is made obvious by the Governor's proclamation of April 18, 1914, as Fire Prevention Day. One aim of the proclamation is to decrease the fire risk throughout the State by emphasizing the advisability of being careful with fire during the summer months, and of making improvements which will prevent the spread of fires, both in forests and in chaparral and grass.

That the spirit may be carried out to the fullest extent the exercise has been prepared with the hope that each student will be permitted to get the substance of the lesson. Effort has been made to present the most important phases of protective work. Since it is suggested that two consecutive class periods will be devoted to this subject, it might be well to devote the first hour to a study period during which time the students will read the exercise carefully preparatory to questions which the teacher may wish to ask in the following period. A few pupils may be asked to give in their own words what the lesson teaches. The teacher may present to the students the substance of the lesson, with added suggestions, during the second hour, impressing upon them the importance of fire prevention and its inevitable influence on the preservation of forests and human lives.

A series of prizes is offered by officers of the State Board of Forestry for the best titles for the picture on page 7. The plate represents first, a woodland area typical of many of our valuable pine forests; the second, a forest fire, caused probably by carelessness—nothing is done in California to stop these fires; and the third explains itself, an area fire swept, desolate and of practically no value. Two sets of prizes are offered. Two first prizes of $5.00; two second prizes of $3.00; and two third prizes of $1.00 will be paid. One set of prizes will be awarded for the three best titles from the seventh, eighth and ninth grades; the other set for the three best titles from the tenth, eleventh and twelfth grades. The competition will close April 30th, and all titles should be in the State Forester's office by the afternoon of the same date. The full name, address, school and grade of the student must accompany the title. The word "Title" must appear on the upper left corner of each envelope, and the latter addressed to the State Forester, Sacramento, California. Credit will be given for neatness, handwriting, and letter construction.

STUDENTS' APPEAL FOR PROTECTION OF THEIR FORESTS.

If, after the lesson, certain students feel inclined, they may direct a letter to their respective senators and assemblymen, urging state protection of their forests, streams, hunting grounds, and watersheds. The children should feel that they have a right to expect the forests to be protected for them. The perforated blank sheets in the back of this pamphlet may be used for this purpose.

THE FORESTS OF CALIFORNIA.

Our State extends, in a direct north and south line, approximately 750 miles and from sea level we rise to the highest point in the United States, Mt. Whitney, which is 14,898 feet in elevation. The State is truly a remarkable one, in that there are to be found within its borders so many variations of climate, so many contrasts in scenery from ocean shore to snow-capped mountain peaks. Just as different tribes of people adapt themselves to climate and altitude, so each forest tree finds one climate and one range of elevation best suited to its growth. One kind of tree will prefer the high and steep slopes of the mountains, while another species will not grow well unless it is planted in a wide fertile valley or near the seashore. Because of this there are different types of forests in California. A broad division might be made as follows:

Redwood Forests.

These forests are limited in their extent. The redwood trees, which are cut for lumber, are found only on a narrow strip of land along the California coast from Monterey County to the Oregon line. These forests like the damp ocean air and require quite a bit of rain. Forest fires do not do very much damage to redwood forests until after logging; then many dead branches are on the ground and become so dry during the summer that fires sweep through them and often kill the little new trees that are coming up to replace those taken away by the lumbermen.

Oak Forests.

There are many different kinds of oak trees in California. One of the most beautiful oaks is the one called Valley Oak. Years ago there were large forests of this species in the two great valleys of the State. Many of the trees have been cut down and now there are comparatively few left, scattered here and there.

Pine and Fir Forests.

These are very large and valuable forests and are found generally in the mountain and foothill regions. Pine forests suffer from fire each year, and some plan must be adopted to reduce the danger of fire destroying the old as well as the young trees. Very often there are many kinds of bushy plants growing under the big trees, and when these catch fire the flames are so hot that the trees themselves are burned. The most valuable tree of our State is the sugar pine, and soon there will be very few of them left. Every summer thousands of little sugar pine trees are killed by fires which might be prevented. If this destruction is allowed to continue, there will be no sugar pines left by the time the children of to-day grow up; there will hardly be any valuable forests left unless we provide for them.

Chaparral Forests.

Thousands of acres of mountain and hill land in the State are covered with "brush." This vegetation consists of many different forms of low growing trees and shrubs. Manzanita, buckthorn, several varieties of sage, scrub oak, lilac, and a great many others go to form what we collectively term chaparral forests.

WHAT OUR FORESTS MEAN TO US.

A country without forests is indeed poor. Forests not only provide us with fuel and lumber, but indirectly they affect every industry. The wild animals find their food and shelter in the woods. Campers would find little pleasure if they were forced to spend their vacation in a country without trees and streams. We all like the woods; there is a charm in the rippling brook and a delight in the music of the wind through the trees. When summer comes these pleasures call us and invite us to become a part of them. What fairy tale is worth telling which has no forest mystery? One of the oldest definitions for a forest was given by Manwood in 1598. He called a forest "a certain territory of woody grounds, fruitful pastures, privileged for wild beasts and fowls of the forest, chase and warren, to rest and abide in, the safe protection of the King for his princely delight and pleasure." Still recognizing the true value of the forests the latest revised Encyclopædia Britannica gives the following definition: "A forest is an area which is for the most part set aside for the production of timber and other forest produce, or which is expected to exercise certain climatic effects, or to protect the locality against injurious influences."

THINGS THAT FORESTS GUARD AGAINST.

1. The woods provide grateful shade in summer from the heat of the sun.

2. In winter, when fierce winds and storms come, the forests serve to protect against damage. They act as great wind breaks and provide shelter for the wild animals.

3. When hillsides are bare and without trees the rain often washes great ditches which become so numerous that the land is useless to farmers. This action is called "erosion." Trees and shrubs send their roots into the ground and tend to keep the water back and allow it to sink into the ground instead of rushing off on the surface.

4. In the same manner forests often prevent floods and torrents in winter. The roots act as filters and permit the rain water to pass through the soil slowly. Because of this springs are often regulated and streams flow steadily all through the year. This is much better than to have a rushing muddy torrent during the winter and a dry sandy creek bed all through the summer. A watershed covered with trees will discharge a clearer, and far more regular, stream than one that is unforested.

THE NEED OF PROTECTING OUR FORESTS.

So, as long as men need lumber for building their homes, hill land for their farms, protection against summer heat and winter cold, streams for water power and rivers for navigation, the work of protecting the forests will be a duty of every man, woman and child. Keeping fire from destroying the forests in many cases is keeping it from burning our homes, for many of us live near the woods or have brush and forest trees all around our houses. To prevent fire is by all means the best way to control it. Fire, damaging insects, wasteful use of lumber and logs, neglect and several other agencies are enemies of the forest. Fire is the most dangerous. We can learn to be frugal in our use of the forests, but a forest fire has no conscience.

HOW FOREST FIRES START.

Forest and brush fires may start from a hundred different sources. The main causes are:

RAILROADS.

LIGHTNING.—This is one cause which we can not prevent, but we can prevent the fires from becoming large ones.

INCENDIARY.—These fires are set on purpose and the penalty for lighting such fires is very severe.

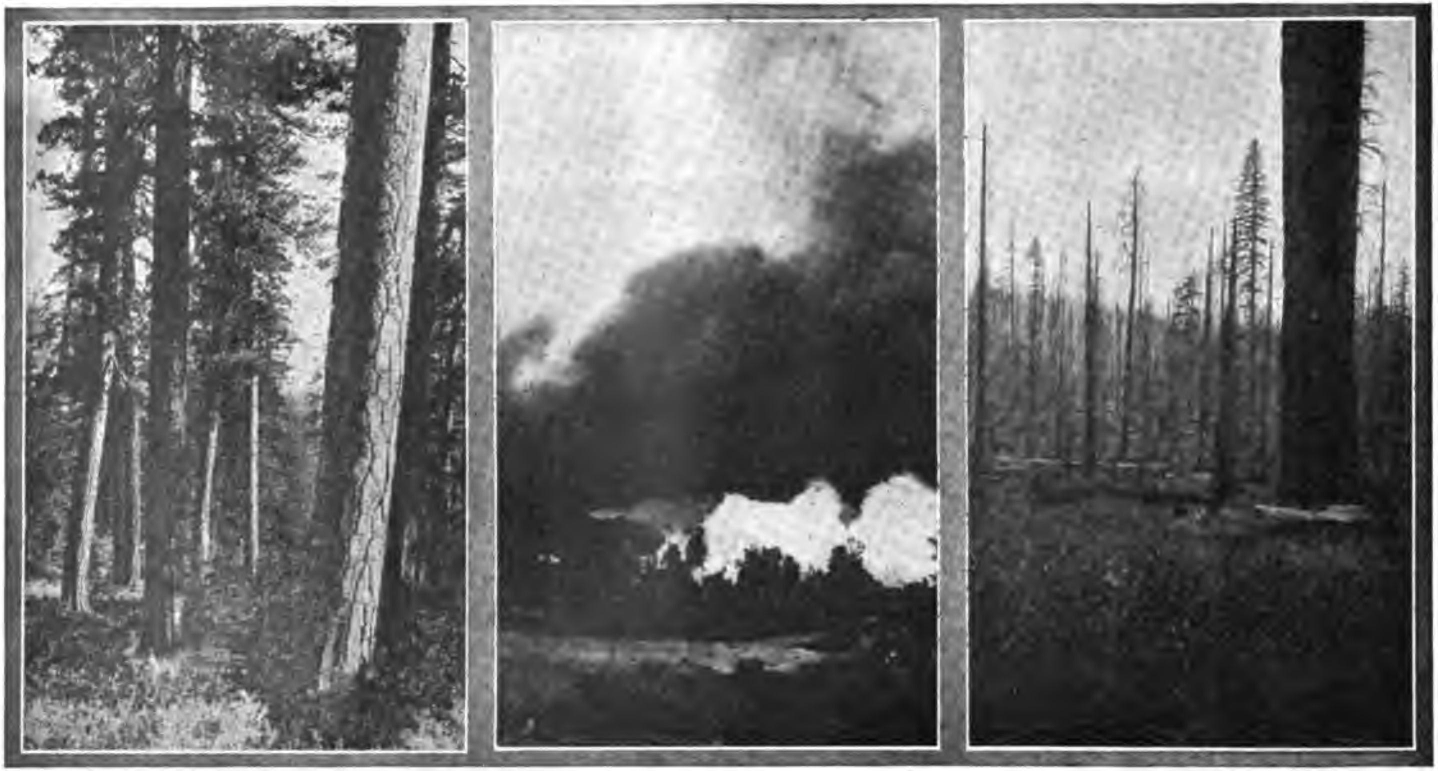
BRUSH BURNING.

CAMPERS AND HUNTERS.—This is a very important class; picnickers are also included.

SAWMILLS.—Sparks from sawmill stacks start fires at times.

UNKNOWN.—Many fires can not be traced to their start and no one knows how they begin.

MISCELLANEOUS.—All sorts of causes not placed under the other headings are included in this class. Fires starting from electric wires, for example, would be classed as "miscellaneous."



This picture has no title.

Prizes will be given for the best titles. No title must exceed forty-five words. Write plainly in ink. Titles must be in your own words. Ask the teacher about it.

HOW FIRES DO DAMAGE.

When a fire gets away and burns through a forest, even if the big trees are not killed, the little ones are, and often the big ones are injured so that they will always be scarred. A grass fire frequently kills little trees that are in its path by scorching the limbs and stems or by heating the roots to such a point that they fail to take in nourishment any longer. The tender bark at the base of the trees also may be baked—this will result almost always in killing the trees.

Large forest trees are killed by fire when there is sufficient underbrush to make a very hot flame, or when the wind is high and carries the fire up into and through the tops of the trees.

A little care will prevent the burning to death of many of our wild animals. Protecting the forests means also the protection of all sorts of animal and bird life.

When pasture grass burns, the soil is injured by being baked and also by being robbed of certain chemical elements which nature intends should be returned in some way.

When brush is burned on a whole mountain the slopes are left bare and "erosion" will very likely take place when the next heavy rains come. Quite often wild animals get caught in brush fires, and, not knowing where to run for safety, are burned to death. Many deer and hundreds of rabbits lost their lives during the fires last summer.

When a fire starts no one is able to say just how far it will spread. Last September a little fire started in some brush; few people thought anything about it, but before it was out hundreds of men were called to fight it. A woman, living in a small house in the woods, saw the fire coming and ran, with her little daughter, into the cellar. The house caught fire and both mother and little girl were burned.

So fires do destroy human lives, forests, homes, fences, little trees (which should be the forests of the future), farms, and many other valuable things. Do you think it is worth while being careful? Is is not worth our time to remember to prevent fires starting?

One careful thought may prevent untold damage and hours of bitter regret.

HOW TO FIGHT FOREST FIRES.

Grass Fires.

These can sometimes be put out by using wet sacks. If the wind is blowing hard it will be difficult to beat the flames out, and the best way, in this case, is to scrape and clear a trail in front of the fire and try to keep the flames from jumping across it. Never back-fire unless it is absolutely necessary. Remember that a back-fire set to save one house may burn up many others if it is poorly planned. Make clearings around your homes before a fire threatens you and you won't regret it. Put a little grass fire out as quickly as possible because it will spread rapidly if neglected and will soon become a raging wall of flames. Hoes, rakes, yard-brooms, wet sacks and green boughs are the best things to use in putting out a grass fire.

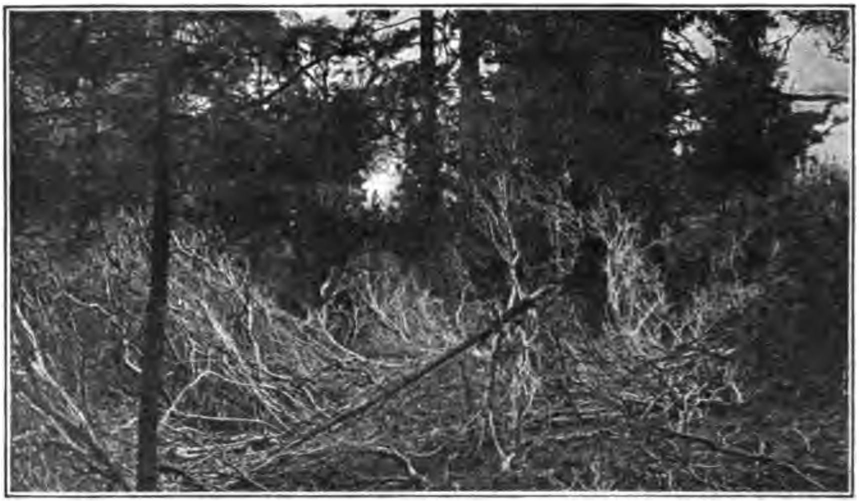
Timber Fires.

These can best be fought by preventing them. When a fire is burning through the tops of trees it is very hard to handle. The work of controlling such a fire calls for a large number of men, and firebreaks must be cut some distance in front of the flames. When dead brush and litter is cleared away from under the trees there will be little danger of a timber fire spreading, under ordinary wind conditions. In fighting a timber fire it is sometimes necessary to dynamite the standing snags to prevent their scattering sparks. Axes, saws, brush-hooks and shovels are always useful in fighting a timber fire.

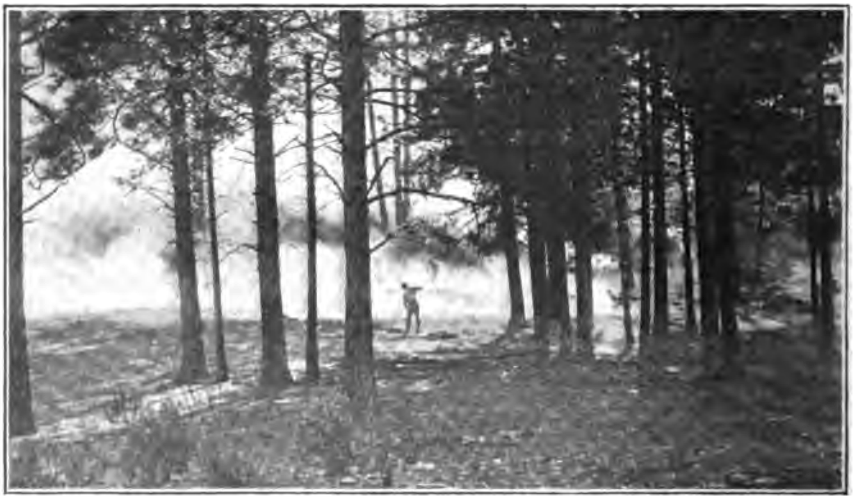
Brush Fires.

Make a firebreak—that is, a cleared trail from 10 to 50 feet wide—through the brush, preferably along a ridge, before a fire threatens you. If a fire does come, guard the firebreak or a road in front of the fire and try to keep the flames back. Quite often a very good back-fire can be started from just such a firebreak. Shovels and brush-hooks are the most valuable tools in the brush, but quite frequently axes, hoes and rakes can also be used to advantage.

Always call a firewarden or some grown men to help you when a fire gets away. Don't wait and wonder whether or not you can put the fire out alone unless you are sure that you can. Do as the fire will do if it gets a chance—ACT QUICKLY.



There is a great deal of dead brush and many small dead trees in our forests. Such material burns readily and a fire once started in it is difficult to control; it kills or injures many of the living trees and destroys most of the smaller ones. The picture on the cover shows such material being piled in the open where it will be burned during the wet season.



This picture was taken in a forest where the conditions were similar to those shown above; but here the dead brush and trees have been burned and the live trees are now comparatively safe from fire. A fire lane has been built to keep out fires starting on areas that have not been cleared up.

WHAT EVERY STUDENT SHOULD KNOW.

1. The total acreage of land surface in California is 99,898,880 acres. Texas is the only state larger than California.

2. There are approximately 20,604,000 acres of forest land in California.

3. There are nineteen national forests in the State representing a total area of 12,104,000 acres.

4. There are approximately 12,786,306 acres of merchantable forests in California.

5. There are 8,500,000 acres of these merchantable forests privately owned.

6. California has no state forests; several states have.

7. The forests outside the national reserves are very poorly protected from fire because California has failed to let the people make a law that is necessary.

8. Forest fires result in the loss of human life, public improvements, timber, little trees that would some day be big ones, game, homes, orchards, live stock, forage and plants from which bees get their honey.

9. The length of the fire danger season in California is from May 15th until October 15th. This means that everything is so dry during this period that fires will easily start unless everyone is careful to prevent them.

10. The six rules which should always be remembered are:

(1) Be sure your match is out before you throw it away.

(2) Knock out your pipe ashes or throw your cigar or cigarette stump where there is nothing to catch fire. Better yet—don't smoke.

(3) Don't build a camp fire any larger than is absolutely necessary. Never leave it even for a short time without putting it **out** with water or dirt.

(4) Don't build a camp fire against a log or tree. Build a small one where you can scrape away the needles, leaves or grass from all sides of it.

(5) Don't build bonfires. The wind may come up at any time and start a fire you can not control. **Never play with matches.**

(6) If you discover a fire, get word of it to the nearest State Firewarden or Forest Officer or the land owner as quickly as you possibly can.

Learn and remember and practice these rules and you will be a valuable citizen.

11. California has not set aside a single dollar for forest protection. The United States government wants to help us but will not until our State does something to help herself.

12. Every one can help by urging that California as a State adopt a fire protection plan.

13. The State must pass the most suitable kind of forestry laws and provide enough money to work out the laws.

14. It is especially important to keep fire patrols in the woods during the summers.

15. During 1913 in California 61,812 acres of merchantable forests were burned over. This represents a money loss of approximately $124,059.

16. The total money loss occasioned by forest fires in 1913 in California, including damage done to houses, timber and pastures, amounted to $511,077. This amount of money is enough to pay for protecting the forests for several years and we have allowed it to go up in smoke.

WHAT WE CAN DO TO PREVENT FIRES.

To-day let us plan some way in which we will make it harder for a fire to start in our community during the coming summer months.

Those of us who live near brush and forests can prevent possible danger by carefully cleaning away the dry grass and inflammable material from around our homes.

When we see campers starting out for their vacation let us not forget to warn them to be careful with their camp fires and matches.

When we go on a picnic let us watch to see that the fire, if one is lit, is safely placed, carefully watched and entirely put out before leaving.

Let us never build a fire to burn brush or rubbish unless there is plenty of open bare land all around the pile that is to be burned.

We should never think of building any bonfire or even a camp fire on a very windy day. If a camp fire is necessary on a windy day let us take all the more care with it and put it entirely out with water before leaving it.

Don't forget that sensible people **never** play with matches.

Boys! Don't "smoke out" bees unless you intend to "stay with it" to put the fire out.

It is dangerous to throw firecrackers into dry grass. Let us leave the fireworks at home when we go camping or on Fourth of July picnics.

Don't watch a little grass fire because it looks pretty. Put it out.

Take this pamphlet home and show it to your parents and ask them to help too.

Never forget that **big fires will always be prevented if we are always careful with small ones.**

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